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DEVELOPMENT OF VOCABULARY FOR DEMONSTRATION OF SPEECH CONCATENA--ETC(U)
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DEVELOPMENT OF VOCABULARY FOR DEMONSTRATION OF SPEECH CONCATENATION SYSTEM

Ephraim Shochet

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INTERIM REPORT

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FEDERAL AVIATION ADMINISTRATION
Systems Research & Development Service
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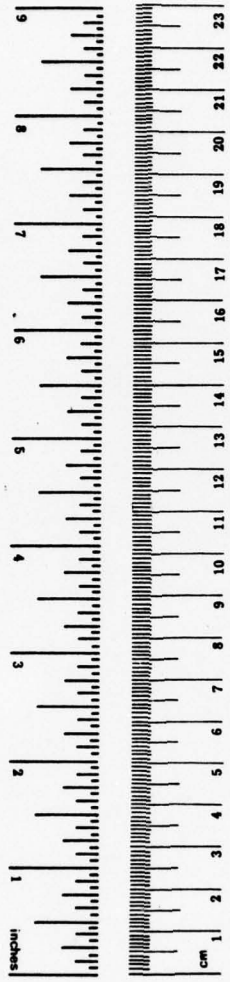
METRIC CONVERSION FACTORS

Approximate Conversions to Metric Measures

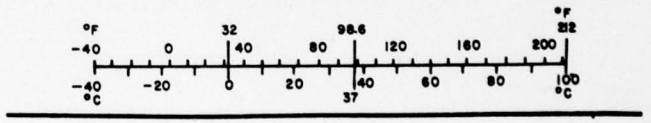
Symbol	When You Know	Multiply by	To Find	Symbol
	LENGTH			
in	inches	*2.5	centimeters	cm
ft	feet	30	centimeters	cm
yd	yards	0.9	meters	m
mi	miles	1.6	kilometers	km
	AREA			
in^2	square inches	6.5	square centimeters	cm^2
ft^2	square feet	0.09	square meters	m^2
yd^2	square yards	0.8	square meters	m^2
mi^2	square miles	2.6	square kilometers	km^2
	acres	0.4	hectares	ha
	MASS (weight)			
oz	ounces	28	grams	g
lb	pounds	0.45	kilograms	kg
	short tons (2000 lb)	0.9	tonnes	t
	VOLUME			
tsp	teaspoons	5	milliliters	ml
Tbsp	tablespoons	15	milliliters	ml
fl oz	fluid ounces	30	milliliters	ml
c	cups	0.24	liters	l
pt	pints	0.47	liters	l
qt	quarts	0.96	liters	l
gal	gallons	3.8	liters	l
ft^3	cubic feet	0.03	cubic meters	m^3
yd^3	cubic yards	0.76	cubic meters	m^3
	TEMPERATURE (exact)			
°F	Fahrenheit temperature	5/9 (after subtracting 32)	Celsius temperature	°C

*1 in = 2.54 (exactly). For other exact conversions and more detailed tables, see NBS Misc. Publ. 286, Units of Weights and Measures, Price $2.25, SD Catalog No. C13.10:286.



Approximate Conversions from Metric Measures

Symbol	When You Know	Multiply by	To Find	Symbol
	LENGTH			
mm	millimeters	0.04	inches	in
cm	centimeters	0.4	inches	in
m	meters	3.3	feet	ft
m	meters	1.1	yards	yd
km	kilometers	0.6	miles	mi
	AREA			
cm^2	square centimeters	0.16	square inches	in^2
m^2	square meters	1.2	square yards	yd^2
km^2	square kilometers	0.4	square miles	mi^2
ha	hectares (10,000 m^2)	2.5	acres	
	MASS (weight)			
g	grams	0.035	ounces	oz
kg	kilograms	2.2	pounds	lb
t	tonnes (1000 kg)	1.1	short tons	
	VOLUME			
ml	milliliters	0.03	fluid ounces	fl oz
l	liters	2.1	pints	pt
l	liters	1.06	quarts	qt
l	liters	0.26	gallons	gal
m^3	cubic meters	35	cubic feet	ft^3
m^3	cubic meters	1.3	cubic yards	yd^3
	TEMPERATURE (exact)			
°C	Celsius temperature	9/5 (then add 32)	Fahrenheit temperature	°F



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16. Abstract

The purpose of this report is to document the development of a full and comprehensive vocabulary of words and phrases (predominately phrases), derived by message analysis of a large sample of verbal output from the New York City Pilots Automatic Telephone Weather Answering Service (PATWAS). This vocabulary is developed to test and evaluate the capability of disseminating PATWAS messages by a prototype speech concatenation system being developed at the National Aviation Facilities Experimental Center (NAFEC). One of the key objectives of the prototype model is to demonstrate the capability of disseminating PATWAS messages by the method of automatic message composition. It is apparent that recently developed digital techniques can enhance the achievement and acceptability of word-concatenated speech, and thus present a future possibility of producing spoken weather reports, and other valuable communication services. A necessary step in the vocabulary preparation phase is the development of a corpus of utterances that represent the linguistic domain for PATWAS messages. This corpus of utterances, entitled "Vocabulary for Demonstration of Speech Concatenation System" is contained in this report. In general, the aim is to provide a full and comprehensive vocabulary designed to include: (1) a message introduction, (2) a winds aloft forecast, (3) hourly observations, (4) flight precautions, (5) synopsis reports, (6) terminal forecasts, (7) route forecasts, and (8) Notices to Airmen (NOTAM's) on a route-oriented basis. The vocabulary as contained in this report will be subject to test and evaluation with the objective of reducing the vocabulary size to the point where it is neither greater than nor less than what is required.

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PREFACE

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We were helped in the preparation of the vocabulary for this report by being able to use the information contained in the position paper, "Recommendations and Options for Reorganizing the Domestic Aviation Forecast Program within the NWS," provided to us by Edward Gross of the National Weather Service Headquarters. We hereby thank Mr. Gross for his assistance. A special thanks to Charles Archambault of the National Weather Service Forecast Office for providing us with formats for synopsis reports which we utilized in this report.

Acknowledgement is given to Edward Boucher who wrote the Program Specification.

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INTRODUCTION

PURPOSE.

The purpose of this report is to document the development of a full and comprehensive vocabulary of words and phrases (predominantly phrases) derived by message analysis of a large sample of verbal output from the New York City Pilots Automatic Telephone Weather Answering Service (PATWAS). This vocabulary was developed to test and evaluate the capability of disseminating PATWAS messages by a prototype speech concatenation system being developed at the National Aviation Facilities Experimental Center (NAFEC).

BACKGROUND.

The Flight Service Station Modernization Program is directed at an increase in productivity through automation. This program is designed to meet the increasing demand for services (and improved services) to the general aviation fleet without a large expansion of staff. The program will thus largely depend on automation where feasible. The Federal Aviation Administration (FAA) has demonstrated, in more than one trial field installation, that an improved PATWAS will be heavily used by the pilot. In conducting the New York City PATWAS experiment (reference 1), it was demonstrated that an improved PATWAS did transfer workload from the specialist to hardware.

The master plan for the Flight Service Station Modernization Program proposes that a significant share of pilot briefing services be provided by mass dissemination processes.

Provision of aviation weather information to the pilot through mass dissemination provides an acceptable, low-cost alternative to one-on-one briefings much of the time. A specialist can retrieve, assemble, and prepare for dissemination information which will more than adequately serve the needs of a large number of users (with little or no intervention by the specialist) and he is thereby freed to perform other important tasks, without interruption. If the mass weather dissemination system is intelligently designed and properly deployed, user needs can be better met and there can also be greater productivity at a given staffing level.

The Systems Research and Development Service (SRDS) has asked NAFEC to develop and test the application of digital technology to the mass dissemination of aviation weather and aeronautical information. The end product of this effort will be a prototype model compatible with Flight Service Station (FSS) modernization and capable of (1) providing the reliability of modern-day solid-state equipment, (2) transferring specialist workload to system equipment, (3) providing natural-sounding speech messages, (4) providing synchronous access to multiple messages, (5) assigning any message to any one of the telephone lines.

The application of digital techniques is primarily aimed at providing a natural-sounding voice audio output. The primary reason for this is that telephone and radio are the two most easily accessible devices to the aviation users. The pilot should not be required to purchase, make available, or carry with him any other device in order to obtain necessary weather information. From the FSS specialist viewpoint, the application of digital techniques can provide him with the capability to record, update, and retrieve weather data much quicker and easier than with magnetic tape/drum. Weather data, being in digital form, will be available for fast-time updating and handling.

PROTOTYPE MODEL

FUNCTIONAL DESCRIPTION OF PROTOTYPE MODEL.

The prototype model being developed at NAFEC will demonstrate the following capability. The system will be designed to:

1. Provide one number access to each of five messages (maximum of 10 minutes each) through any 1 of 20 telephone lines.

2. Provide message selection by way of an utterance recognition device capable of handling eight callers simultaneously.

3. Provide noninterfering rapid message update.

4. Service 20 telephone lines simultaneously, with any mix of message to line, and with no discontinuity of message presentation.

5. Provide for manual and automatic message composition and update.

6. Provide for the delivery of a message from its beginning every time that message is requested.

7. Provide natural-sounding speech.

The design objective of the system is to provide the pilot with one call service. The engineering model will provide each of five briefings to any of 20 telephone lines in any mix of briefing to line. The major system components are: (a) a digital computer, (b) a disc message storage unit, (c) an encoder for converting the spoken word to a digital representation, (d) a decoder for reconstructing the spoken word from the digital representation, (e) a system switching unit which connects the pilot to the recorded briefing, a flight plan recorder, or an FSS specialist, and (f) an utterance recognition device (URD) programmed to recognize each of 25 separate words on eight telephone lines simultaneously.

SYSTEM DESCRIPTION.

It is envisioned that the prototype system to be demonstrated will function in the following manner:

Upon being connected to the system, the pilot is presented with an introductory message and is offered three options; namely, to be presented with a weather briefing, to file a flight plan, or to speak to a specialist.

Upon completing the introduction, the computer tells the URD to issue a cue tone and to listen for the subset of utterances, "briefing," "file," and "specialist."

If the pilot says "briefing," the URD recognizes this utterance and sends a unique code to the computer. The computer starts a message telling the pilot he can select from a North, South, East, or West route oriented briefing or a general local area briefing by saying the appropriate word at the cue tone. The computer then tells the URD to issue a cue tone and to listen for the subset of utterances North, South, East, West, or local.

If the pilot says "North," the URD recognizes this utterance and sends a "North" code to the computer. The computer then causes the north route oriented briefing to be read to the pilot.

At the completion of the briefing, the system asks the pilot if he wishes to file a flight plan or speak to a specialist. The computer then tells the URD to issue a cue tone and to listen for the subset "briefing," "file," and "specialist." If the pilot says "specialist," the URD will recognize the word and send the "specialist" code to the computer. The computer will then direct the connection of the pilot to an FSS specialist. It is expected that the informed pilot will occupy very little of the specialist's time.

Upon completion of the transaction, the specialist asks the pilot if he wishes to file a flight plan. If the pilot says "Yes," the specialist asks the pilot to speak his flight plan following the cue tone and reconnects the pilot to the system.

A cue tone is issued and the pilot records his flight plan. At the completion of the flight plan filing, the system recognizes silence and then asks the pilot if he wishes the flight plan read back to him. The computer tells the URD to issue a cue tone and to listen for the subset "Yes" and "No."

If the pilot says "Yes," the URD sends the "Yes" code to the computer which tells the flight plan recorder to rewind and play the last recording. The system then asks the pilot if he wants to file as read. The computer tells the URD to issue a cue tone and to listen for the subset "Yes" and "No." If the pilot says "Yes" the URD recognizes this utterance and sends the "Yes" code to the computer which then completes the pilot's transaction with, "Thank you, have a good flight" (figure 1).

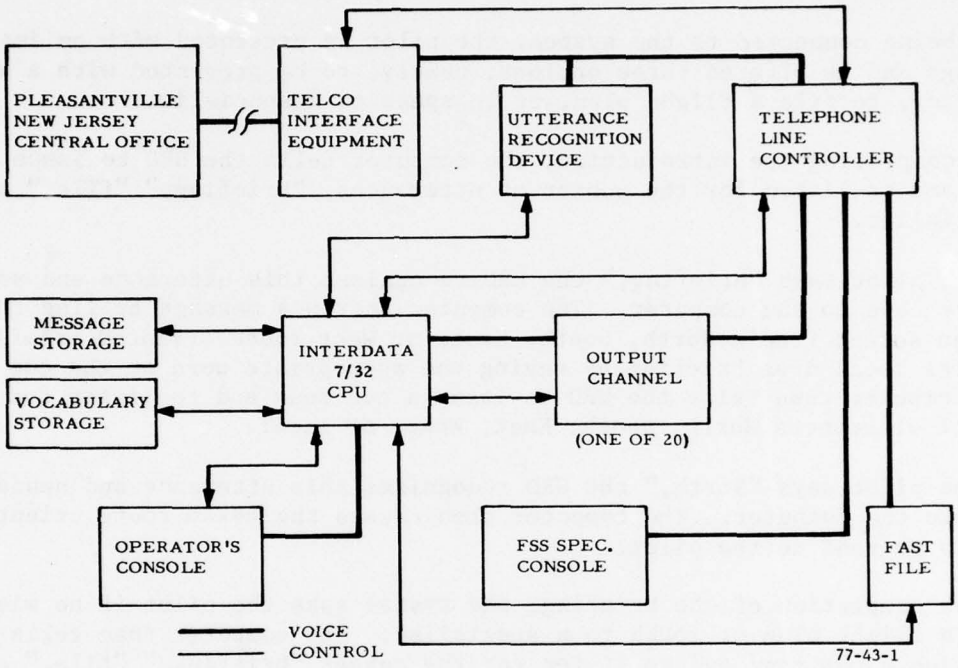

FIGURE 1. PROTOTYPE MASS DISSEMINATION SYSTEM

ADVANTAGES.

The important advantages to be gained through the development of the prototype system are as follows:

(1) Multiple message storage, (2) Message composition at the smallest reporting entity (i.e., terminal forecast (FT) for Washington, D.C. (DCA) or surface observation report (SA) for Philadelphia (PHL), (3) Rapid, noninterfering message update, (4) Natural-sounding voice, (5) Automatic message composition via phrase and qualifier/quantifier inserts, (6) Elimination of message-dedicated telephone lines, (7) Acquisition of message at the beginning, (8) Line use is caller determined, (9) One telephone number access, (10) Economical message preparation, (11) Maximum utilization of telephone lines, (12) Significant decrease in data communication load through automatic message composition, (13) Capability of expansion to include other functions as flight plan filing (fast file), (14) Greater consistency and control over the format, organization, terminology, sentence structure, and delivery of PATWAS messages.

AUTOMATIC MESSAGE COMPOSITION

One of the key objectives of the protype model is to demonstrate the capability of disseminating PATWAS messages by the method of automatic message composition. It is apparent that recently developed digital techniques can enhance the achievement and acceptability of word-concatenated speech, and thus present a future possibility of producing spoken weather reports and other valuable communication services.

The system is based on the concatenation of natural speech. A digitized voice system will be used to represent and process PATWAS vocabulary elements by automatic message composition. An analog-to-digital converter will change the PATWAS vocabulary elements to digital form. Vocabulary elements will be stored in digital memory. The digital representation of the desired output message will be formed by the message composition system which locates the required vocabulary elements and concatenates them in the proper sequence. The digital-to-analog converter will then change the digital representation to an analog signal.

The Interdata 7/32 procured for the FSS laboratory will also be used as a central processing unit for the automatic message composition system. Additional hardware has been procured specifically for the automatic message composition effort. The major items for this effort include the disk units and controllers.

REQUIRED CHARACTERISTICS OF THE PRODUCT.

There is a difference between speech that is intelligible and speech that sounds natural. Natural-sounding speech contains distinctive rhythmic and melodic patterns. Virtually every sentence that is spoken in English contains a succession of distinctive pitch contours and intonation patterns (prosody). All PATWAS weather reports are spoken with prosodic cues; the absence of prosody gives speech an unnatural quality. While speech may be intelligible without sounding natural, natural-sounding speech can foster semantic reception of sentence-length utterances. It is apparent that stress and tone phenomena affect acoustic decoding by providing suggestive cues to the listener. Olive and Nakatani have pointed out that "lack of continuity and prosody make all the words in the sentence sound equally prominent, and thus places the entire burden of assessing the relative importance of the individual words on the listener" (reference 2). In addition, the quality and naturalness of speech utterances have a significant effect on both the usefulness and user acceptability (reference 3). Therefore, the required characteristics of the product will be speech that is both highly intelligible and natural sounding.

VOICE OUTPUT.

The PATWAS message, although replete with short, choppy phrases, is nevertheless highly contextual. If the message is composed by concatenating isolated word-length utterances with no adjustment for rhythm, timing, and intonation, the voice output will not be highly intelligible or natural sounding. The basic

reason for this is that the prosodic features of individual words are not invariant under transformation of context, but vary according to their relation to other words in the sentence and to the sentence as a whole. "Features of a sound which are distinctive in one position may not be distinctive when the same sound is in another position" (reference 4).

Prosody is an important characteristic of natural speech. When sentences are composed entirely of concatenated isolated words, the speech has a disjointed, expressionless sound. Prosody is therefore an important consideration in the development of speech concatenation systems. The problem is to discover how to join isolated speech segments together so that the result is intelligible and natural sounding. One practical way of gaining a foothold is to go around the problem by very carefully developing a vocabulary of phrases rather than words. In this way it is possible to improve the voice output without getting bogged down in prosodic complications of concatenating isolated words. It is for this reason that a PATWAS vocabulary comprised mostly of phrases rather than isolated words has been developed for test and evaluation of automatic message composition.

The concatenation of whole phrases takes advantage of inherent prosodic features that are lost in the concatenation of isolated words. It is clearly advisable to retain as much inherent prosody as possible rather than dissect a phrase into individual word units and then try to impose the necessary prosodic features from without.

CONSTRAINT.

Another strategy that has been employed in the system design is the reduction in the number of unconstrained inputs. An imposed format for PATWAS messages has been developed for each segment. These formats will be used in the demonstration of automatic message composition. Like the vocabulary, the formats are subject to change or modification. The formats developed are indicated below. It should be noted that patterning of message material helps the receiver to comprehend or decode the message.

INTRODUCTORY SEGMENT

THIS IS THE NATIONAL WEATHER SERVICE OFFICE AT LAGUARDIA AIRPORT WITH A RECORDING OF AVIATION WEATHER FOR ROUTE. ALL TIMES ARE GREENWICH MEAN TIME.

WINDS ALOFT

THE WINDS ALOFT FORECAST FOR AREA, TIME, HEIGHT, DIRECTION, SPEED.

HOURLY OBSERVATION

THE FOLLOWING ARE THE OBSERVATIONS TAKEN AT ____ GREENWICH MEAN TIME WHICH IS ____ LOCAL TIME, STATION, SKY CONDITION AND CEILING, VISIBILITY ____, WEATHER AND OBSTRUCTIONS TO VISION, TEMPERATURE ____, DEW POINT ____, WIND ____, ALTIMETER SETTING ____, REMARKS.

TERMINAL FORECAST

STATION, UNTIL TIME SKY AND CEILING, VISIBILITY ____, WEATHER AND OBSTRUCTIONS TO VISION, WIND ____, REMARKS, FROM TIME UNTIL TIME, SKY AND CEILING, VISIBILITY ____, WEATHER AND OBSTRUCTION TO VISION, WIND ____, REMARKS. FROM TIME UNTIL TIME, SKY AND CEILING, VISIBILITY ____, WEATHER AND OBSTRUCTION TO VISION, WIND ____, REMARKS. SIX HOUR OUTLOOK AFTER TIME ____.

SYNOPSIS

(COLD/WARM/OCCLUDED FRONT) FRONT ALONG A LINE FROM LOCATION TO LOCATION, MOVING DIRECTION ABOUT SPEED TO A POSITION ALONG A LINE FROM LOCATION TO LOCATION BY TIME.

(DISSIPATING FRONT) FRONT FROM LOCATION TO LOCATION WILL DISSIPATE BY TIME.

(FRONT BECOMING STATIONARY) FRONT LOCATION TO LOCATION WILL BECOME STATIONARY BY TIME.

(STATIONARY FRONT) FRONT FROM LOCATION TO LOCATION WILL DRIFT TO A POSITION NEAR LOCATION TO LOCATION BY TIME.

(WEAKENING FRONT-BECOMING STATIONARY) FRONT FROM LOCATION TO LOCATION WILL CONTINUE MOVING SLOWLY DIRECTION AND BECOME STATIONARY ALONG A LINE FROM LOCATION TO LOCATION BY TIME.

(WEAKENING FRONT-DECREASING) FRONT FROM LOCATION TO LOCATION WILL CONTINUE TO DECELERATE AND WEAKEN BECOMING STATIONARY ALONG A LINE FROM LOCATION TO LOCATION BY TIME.

(HIGH AND LOW PRESSURE) PRESSURE SYSTEM CENTERED OVER LOCATION WILL MOVE DIRECTION ABOUT SPEED TO A POSITION NEAR LOCATION TO LOCATION BY TIME.

(RIDGE AND TROUGH) RIDGE/TROUGH, POSITION FROM LOCATION TO LOCATION MOVING DIRECTION ABOUT SPEED TO NEAR LOCATION TO LOCATION BY TIME.

(CIRCULATION FLOW) DIRECTION OF FLOW, OF TYPE OVER THE FORECAST AREA UNTIL TIME.

SELECTED NOTAM'S

STATION, NAVIGATION/LIGHTING AID, CONDITION.

(OBSTRUCTION LIGHTS) STATION, TYPE, HEIGHT, DISTANCE/DIRECTION, CONDITION.

(BRAKING ACTION) STATION, RUNWAY BRAKING ACTION IS NIL.

(COMMISSIONING OR DECOMMISSIONING OF LANDING AREA) STATION, RUNWAY, STATUS, SURFACE, LIGHTING, LENGTH, BY WIDTH.

(SNOW/SLUSH/WATER CONDITIONS) STATION, RUNWAY IS COVERED BY CONDITION TO A DEPTH OF INCHES/FEET, STATUS.

(RUNWAY RESTRICTIONS) STATION, RUNWAY, RESTRICTION, FROM TIME TO TIME.

(HOURS OF OPERATION) STATION CONTROL ZONE FROM TIME TO TIME ON DAYS OF WEEK.

STATION AIR TRAFFIC CONTROL TOWER IN OPERATION FROM TIME TO TIME ON DAYS OF WEEK, FREQUENCY THROUGH DATE.

FLIGHT PRECAUTIONS

TYPE, NUMBER, FLIGHT PRECAUTIONS ARE RECOMMENDED FOR LOCATION FOR WEATHER CONDITION. CONTINUE ADVISORY BEYOND TIME.

ROUTE FORECAST

THE FORECAST OVER THE ROUTE FROM ROUTE, TIME, CLOUD COVER AMOUNT, BASES REMARKS PERTAINING TO BASES, TOPS, REMARKS PERTAINING TO TOPS, IN-FLIGHT VISIBILITY, IN-FLIGHT WEATHER, CONVECTIVE ACTIVITY, FREEZING LEVEL, ICING, TYPE TURBULENCE, HEIGHT OF TURBULENCE.

WIND SHEAR

LOW-LEVEL WIND SHEAR IS EXPECTED AT ____ FROM ____ GREENWICH MEAN TIME TO ____ GREENWICH MEAN TIME. WINDS BELOW SHEAR ZONE FROM ____ DEGREES AT ____ KNOTS, AND WINDS ABOVE SHEAR ZONE FROM ____ DEGREES AT ____ KNOTS.

The practical usefulness of a digital automatic message composition system is a function of a number of important variables. For instance, it will depend in a very large measure on the existence of linguistic and contextual constraints in the message to be communicated. Too much variety or diversity in the message will make the task unmanageable and the outcome ineffective.

One useful way of coping with message variety is through the utilization of constraint. As Ashby noted, "when a constraint exists, advantage can usually be taken of it" (reference 5). There are several types of constraints that are inherent in the PATWAS message system. The existence of a large number of repetitive phrases constitutes one kind of constraint that has been exploited. The finite set of utterances that constitutes the PATWAS vocabulary is another. The predetermined format for various message segments and the relative stability or invariableness of the basic vocabulary are also important constraints. In addition, there are discernible phonetic and syntactic patterns which further constrain the message. It should be noted, however, that despite the existence of these constraints and others that will be imposed, there is enough variety in the message, especially in the route forecast segment, to pose a formidable challenge to the construction of a fully automatic system.

VOCABULARY. A necessary step in the vocabulary preparation phase was the development of a corpus of utterances that represents the linguistic domain for PATWAS messages. This corpus of utterances, entitled Vocabulary for Demonstration of Speech Concatenation System is contained in this report. In general, the aim was to provide a full and comprehensive vocabulary designed to include (1) a message introduction, (2) a winds aloft forecast, (3) hourly observations, (4) flight precautions, (5) synopsis reports, (6) terminal forecasts, (7) route forecasts, and (8) Notices to Airmen (NOTAM's) on a route-oriented basis. The vocabulary used to demonstrate the capability of

disseminating PATWAS messages by automatic message composition was derived from an analysis of messages disseminated by the improved PATWAS located at La Guardia Airport. It should be noted, however, that with the exception of geographical nomenclature, the vocabulary is applicable to any PATWAS location.

The vocabulary was developed by using content analysis procedures of PATWAS messages. Content analysis is defined as "a method of studying and analyzing communications in a systematic, objective, and quantitative manner for the purpose of measuring variables" (reference 6). Content categories were used to determine not only the domain of utterances but a frequency distribution of words and phrases. The major unit of analysis was the phrase, for reasons discussed earlier. The message sample types subjected to content analysis study included the following:

Winds Aloft	150 messages
Hourly Observations	1,950 messages
Terminal Forecast	825 messages
Synopsis	200 messages
Selected NOTAM's	3,520 messages
Flight Precautions	750 messages
Route Forecast	550 messages

These message types encompass seasonal variation and an appreciable amount of weather phenomena. The words and phrases chosen from these message types for the vocabulary exhibit a marked degree of stability. Phrase detection was based largely on frequency of occurrence. All high-frequency words and phrases were included in the vocabulary.

It should be noted that the vocabulary as contained in this report will be tested and evaluated with the objective of reducing the vocabulary size to the point where it is neither greater than nor less than what is required. Economy of language is an important factor in the development of the vocabulary. The objective is to achieve the result with a minimum of words and phrases.

VOCABULARY PREPARATION.

Many variable entries in the message formats will be prerecorded in context to help achieve natural cadence, stress, and inflection. This will be accomplished by the use of an electronic editing system capable of abstracting a single word occurring within a spoken phrase. In addition, The stress and inflectional characteristics of the output speech will be carefully studied for needed improvements. Heuristic probing (trial and error) will be used to arrive at optimal timing between utterances and to find the appropriate stress and pitch assignments in the final product. (Not all problems can be solved algorithmically. Sometimes it is more feasible to obtain a solution by means of heuristic procedures.) In spoken English, words frequently flow or blend into one another with no discernible boundary separating a given word from its

context. A spectrogram of an utterance will often fail to reveal a visible break between words. It appears that a word boundary is determined as much by the context as by the word itself.

CONSISTENCY OF OUTPUT. A recurring criticism of PATWAS is the lack of (1) a standard format and organization of the information, and (2) consistency and control over terminology, sentence structure, and speaking rate or delivery of the message. The effects of this inconsistency and lack of control has been pointed out by K. Hayes in FAA report entitled, "Evaluation of a Sampling of Pilot Automatic Telephone Weather Answering Service (PATWAS)" (reference 7) as follows:

> "One of the most serious communication difficulties for pilots is the inaccurate or at least ill-considered placement of transition words or phrases in the sentence. Seemingly a minor detail, yet the existence of the problem makes it very difficult for the pilot to catch the meaning of the sentence until most of its content has already passed. This problem is further complicated by lack of adequate pausing to separate sentence or phrase elements to indicate when a new thought or aspect of a thought is introduced. Stringing phrases together without prepositions, conjunction, or verb cannot help but confuse. A long example, but not the most difficult to interpret by far, is that of a Minneapolis, July 26, at 562, broadcast: virtually without pause--'occasionally below VFR especially over northern half scattered light rain showers improving with scattered light rain showers or thunderstorms after dark becoming 2000 to 4000 scattered above ground level.' The phrase 'over northern half' refers ambiguously to either 'below VFR especially' or to 'scattered light rain showers improving;' similarly 'after dark' does not clearly relate to the 'improving' conditions, particularly not until one has heard the complete idea. Both problems could be corrected by placing operative phrases, which condition the pilot's thinking about what is to follow them, at the beginning of all information to which they refer and pausing to differentiate the two elements: pause after 'northern half' and restructure sentence to read, 'improving after dark' to precede the conditions that are improving. The principle to be applied to these situations is to place words or phrases that indicate a change of the location or time under discussion before the discussion of those conditions. Similarly, in the 'winds aloft' section, the height of measurement should precede the velocity or, alternatively, parallel sentence structure which always puts the height of measurement after the velocity could be used, making the meaning clear although still not as effectively as the first construction."

It should also be noted that long compound sentences make a message difficult to comprehend. For example, the following geographical description, spoken without adequate pause, can make it difficult for the pilot to assimilate all of the information transmitted. "Cold front extending from Eastern Maine southwestward over Central Massachusetts, Central Connecticut, Southeastern New York, Eastern New Jersey, Eastern Maryland, and over Central Virginia."

To correct this problem, the prototype system will be designed with built-in pausal characteristics, and with encoding rules for the preparation of shorter units of geographic description. Inconsistent use of adjectives is another characteristic of the manual system. Automatic message composition of weather messages can ensure the consistent use of adjectives and other parts of speech. In general, the prototype system will be designed to bring more structure to the encoding process without loss of essential variety or information.

ENCODING THE MESSAGE.

The encoding process will be accomplished manually only for the purpose of demonstrating the capability and feasibility of disseminating PATWAS messages through an automatic message composition system. If the prototype system is approved for operational use at PATWAS locations around the country, then the encoding operation would be accomplished by an automatic input system. The encoding operation will be accomplished as follows: An operator will enter a unique code on the keyboard that will display, on a cathode ray tube, the internal structure of a message segment; i.e., "The winds aloft forecast for _____ is at _____thousand feet, _____degrees at _____knots."

The appropriate numeric and descriptive values are then selected, entered, and displayed in context so that the operator can inspect the complete message segment; i.e., "The winds aloft forecast for New York City and a radius of 50 miles is at 12 thousand feet two three zero degrees at one five knots."

If the message segment is free from error, the operator places it in temporary storage. When all of the message segments are complete, the operator issues the command to enter the message for dissemination.

The encoding operation will be accomplished using a system of mnemonics rather than long menu lists that would be cumbersome and time-consuming.

PROGRAM SPECIFICATION.

Associated with each of the utterances and phrases will be a discrete item tag. The item tag will be identified with the data base having the start location within the data base and the number of blocks (or number of characters). All of the item tags will be contained in one file called the Communications Tag Pool. To differentiate between the fixed phrases and the changing data, a $ will be used as the first character of the fixed phrases.

Two data bases and Communications Tag Pools will be established to facilitate ease of use and flexibility, the first being a voice representation of the utterances, the second, a ASCII file of utterances. This would allow a print out of the briefing as well as the voice files.

The entire ASCII vocabulary will be prepared on cards with the item tag punched in columns 1 through 8 and the vocabulary punched in columns 10 through 80 with continuation on the next card if punched in column 9. After the vocabulary has been read in, the voice data will then be entered by inputting the item tag and then the voice representation. This would establish the voice data base and ASCII data base to be used in the concatenation phase.

Five different briefing file (NORTH, SOUTH, EAST, WEST, AND LOCAL) with eight elements within each file may be addressed and changed. The operator must first indicate the file and element desired and then enter the fixed phrases with eight character blanks representing the inserts for the concatenation. This may also be prepared on cards and read in by the card reader.

The concatenation would be accomplished by addressing the file and element that contains all of the item tags for the fixed phrases with blanks indicating an insert. The file will be displayed on the CRT showing the blank for the insert. The operator would then enter the item tag of the utterance desired and the tag will be placed in with the fixed phrases. When operational changes are needed, the program would differentiate the fixed phrases from the variable utterances by a $ as the first character in the item tag. This allows continuous changing of the utterance item tags as the weather changes. When the files are satisfactory they are released to the Mass Weather Briefing program that allows pilots to hear the updated briefing.

VOCABULARY FOR DEMONSTRATION OF SPEECH CONCATENATION SYSTEM

WIND DIRECTION

ZERO ONE ZERO DEGREES AT
ZERO TWO ZERO DEGREES AT
ZERO THREE ZERO DEGREES AT
ZERO FOUR ZERO DEGREES AT
ZERO FIVE ZERO DEGREES AT
ZERO SIX ZERO DEGREES AT
ZERO SEVEN ZERO DEGREES AT
ZERO EIGHT ZERO DEGREES AT
ZERO NINER ZERO DEGREES AT
ONE ZERO ZERO DEGREES AT
ONE ONE ZERO DEGREES AT
ONE TWO ZERO DEGREES AT
ONE THREE ZERO DEGREES AT
ONE FOUR ZERO DEGREES AT
ONE FIVE ZERO DEGREES AT
ONE SIX ZERO DEGREES AT
ONE SEVEN ZERO DEGREES AT
ONE EIGHT ZERO DEGREES AT
ONE NINER ZERO DEGREES AT
TWO ZERO ZERO DEGREES AT
TWO ONE ZERO DEGREES AT
TWO TWO ZERO DEGREES AT
TWO THREE ZERO DEGREES AT
TWO FOUR ZERO DEGREES AT
TWO FIVE ZERO DEGREES AT
TWO SIX ZERO DEGREES AT
TWO SEVEN ZERO DEGREES AT
TWO EIGHT ZERO DEGREES AT
TWO NINER ZERO DEGREES AT
THREE ZERO ZERO DEGREES AT
THREE ONE ZERO DEGREES AT
THREE TWO ZERO DEGREES AT
THREE THREE ZERO DEGREES AT
THREE FOUR ZERO DEGREES AT
THREE FIVE ZERO DEGREES AT
THREE SIX ZERO DEGREES AT

VISIBILITY RANGE

VISIBILITY BELOW ONE MILE
VISIBILITY BELOW THREE MILES
VISIBILITY THREE TO FIVE MILES
VISIBILITY FOUR TO SIX MILES
VISIBILITY FIVE TO SEVEN MILES
VISIBILITY MORE THAN SEVEN MILES
VISIBILITY LESS THAN FIVE MILES AND RESTRICTED BELOW THREE THOUSAND FEET
VISIBILITY LESS THAN FIVE MILES AND RESTRICTED BELOW FIVE THOUSAND FEET
VISIBILITY LESS THAN FIVE MILES AND RESTRICTED BELOW TEN THOUSAND FEET
VISIBILITY GREATER THAN FIVE MILES BUT RESTRICTED BELOW THREE THOUSAND FEET
VISIBILITY GREATER THAN FIVE MILES BUT RESTRICTED BELOW FIVE THOUSAND FEET
VISIBILITY GREATER THAN FIVE MILES BUT RESTRICTED BELOW TEN THOUSAND FEET

VISIBILITY VALUES

VISIBILITY ZERO
VISIBILITY ONE SIXTEENTH
VISIBILITY ONE EIGHTH
VISIBILITY THREE SIXTEENTHS
VISIBILITY ONE QUARTER
VISIBILITY FIVE SIXTEENTHS
VISIBILITY THREE EIGHTHS
VISIBILITY ONE HALF
VISIBILITY FIVE EIGHTHS

VISIBILITY THREE QUARTERS
VISIBILITY SEVEN EIGHTHS
VISIBILITY ONE
VISIBILITY ONE AND ONE EIGHTH
VISIBILITY ONE AND ONE QUARTER
VISIBILITY ONE AND THREE EIGHTHS
VISIBILITY ONE AND ONE HALF
VISIBILITY ONE AND FIVE EIGHTHS
VISIBILITY ONE AND THREE QUARTERS
VISIBILITY ONE AND SEVEN EIGHTHS
VISIBILITY TWO
VISIBILITY TWO AND ONE QUARTER
VISIBILITY TWO AND ONE HALF
VISIBILITY THREE
VISIBILITY FOUR
VISIBILITY FIVE
VISIBILITY SIX
VISIBILITY SEVEN
VISIBILITY EIGHT
VISIBILITY NINER
VISIBILITY ONE ZERO
VISIBILITY ONE ONE
VISIBILITY ONE TWO
VISIBILITY ONE THREE
VISIBILITY ONE FOUR
VISIBILITY ONE FIVE
VISIBILITY ONE FIVE PLUS
VISIBILITY TWO ZERO
VISIBILITY TWO FIVE
VISIBILITY THREE ZERO
VISIBILITY THREE FIVE
VISIBILITY FOUR ZERO
VISIBILITY FOUR FIVE
VISIBILITY FIVE ZERO
VISIBILITY FIVE FIVE
VISIBILITY SIX ZERO
VISIBILITY SIX FIVE
VISIBILITY SEVEN ZERO
VISIBILITY SEVEN FIVE
VISIBILITY EIGHT ZERO
VISIBILITY EIGHT FIVE
VISIBILITY NINER ZERO

VISIBILITY REMARKS

GROUND VISIBILITY
VISIBILITY AT OR BELOW
VISIBILITY BELOW
VISIBILITY BETWEEN
VISIBILITY DECREASING
VISIBILITY DECREASING RAPIDLY
VISIBILITY FREQUENTLY
VISIBILITY GENERALLY UNRESTRICTED
VISIBILITY IMPROVING TO
VISIBILITY INCREASING
VISIBILITY INCREASING RAPIDLY
VISIBILITY LOWERING TO NEAR
VISIBILITY NEAR
VISIBILITY OCCASIONALLY NEAR
VISIBILITY OVER
VISIBILITY UNRESTRICTED
VISIBILITY VARIABLE

WEATHER

A LINE OF THUNDERSTORMS
BECOMING ALL RAIN
BECOMING MIXED WITH RAIN
BECOMING MIXED WITH SNOW
BEGINNING OF PRECIPITATION
BLIZZARD
CELLS DISSIPATING
CELLS MOVING
CELLS NEARING SEVERE LIMITS
CHANCE LOCALLY OF EMBEDDED THUNDERSTORMS
CHANCE LOCALLY OF SEVERE THUNDERSTORMS
CHANCE OF A BRIEF SHOWER
CHANCE OF A THUNDERSTORM
CHANCE OF BRIEF SNOW SHOWERS
CHANCE OF FREEZING RAIN OR SLEET
CHANCE OF HEAVY RAIN SHOWERS
CHANCE OF HEAVY SNOW SHOWERS
CHANCE OF ISOLATED THUNDERSTORMS
CHANCE OF LIGHT RAIN SHOWERS
CHANCE OF LIGHT SNOW OR SNOW FLURRIES
CHANCE OF LIGHT SNOW SHOWERS
CHANCE OF OCCASIONAL HEAVY RAIN SHOWERS
CHANCE OF OCCASIONAL HEAVY SNOW SHOWERS
CHANCE OF OCCASIONAL LIGHT RAIN SHOWERS
CHANCE OF OCCASIONAL LIGHT SNOW SHOWERS
CHANCE OF OCCASIONAL RAIN OR SNOW SHOWERS
CHANCE OF OCCASIONAL RAIN SHOWERS
CHANCE OF OCCASIONAL SNOW FLURRIES
CHANCE OF OCCASIONAL SNOW SHOWERS
CHANCE OF RAIN DEVELOPING
CHANCE OF RAIN SHOWERS
CHANCE OF SNOW SHOWERS
CHANCE OF THUNDERSHOWERS
CHANCE OF THUNDERSTORMS
CHANCE OF THUNDERSTORMS AND RAIN SHOWERS
CHANGING TO RAIN
CHANGING TO SNOW SHOWERS
CYCLONE
DEVELOPING SNOW SHOWERS
DRIZZLE
EMBEDDED SEVERE THUNDERSTORMS
EMBEDDED THUNDERSTORMS
ENDING OF PRECIPITATION
FEW SHOWERS
FEW THUNDERSTORMS
FLURRY
FLURRIES
FREEZING DRIZZLE
FREEZING PRECIPITATION
FREEZING RAIN
FREQUENT THUNDERSTORMS
FROST
FUNNEL CLOUD
HAIL
HAILSTONES
HEAVY DRIZZLE
HEAVY FREEZING DRIZZLE
HEAVY FREEZING RAIN
HEAVY ICE PELLET SHOWERS
HEAVY ICE PELLETS
HEAVY RAIN
HEAVY RAIN SHOWERS
HEAVY SNOW
HEAVY SNOW SHOWERS
HURRICANE

ICE CRYSTALS
ICE PELLET SHOWERS
ICE PELLETS
IN DRIZZLE
IN FEW SHOWERS
IN FEW THUNDERSTORMS
IN FREEZING DRIZZLE
IN FREEZING PRECIPITATION
IN FREEZING RAIN
IN HAIL
IN HEAVIER PRECIPITATION
IN HEAVY DRIZZLE
IN HEAVY FREEZING RAIN
IN HEAVY ICE PELLET SHOWERS
IN HEAVY ICE PELLETS
IN HEAVY RAIN
IN HEAVY RAIN SHOWERS
IN HEAVY SNOW
IN HEAVY SNOW SHOWERS
IN ICE PELLETS
IN INTERMITTENT RAIN
IN INTERMITTENT RAIN SHOWERS
IN INTERMITTENT SHOWERS
IN INTERMITTENT SNOW
IN INTERMITTENT SNOW FLURRIES
IN LIGHT DRIZZLE
IN LIGHT FREEZING RAIN
IN LIGHT ICE PELLET SHOWERS
IN LIGHT ICE PELLETS
IN LIGHT PRECIPITATION
IN LIGHT RAIN
IN LIGHT RAIN AND LIGHT SNOW
IN LIGHT RAIN, LIGHT SNOW AND ICE PELLETS
IN LIGHT RAIN SHOWERS
IN LIGHT RAIN SHOWERS AND SNOW SHOWERS
IN LIGHT SNOW
IN LIGHT SNOW AND ICE PELLETS
IN LIGHT SNOW FLURRIES
IN LIGHT SNOW SHOWERS
IN NUMEROUS SHOWERS
IN NUMEROUS THUNDERSTORMS
IN OCCASIONAL RAIN
IN OCCASIONAL RAIN SHOWERS
IN OCCASIONAL SNOW
IN PRECIPITATION
IN RAIN
IN RAIN AND SNOW
IN RAIN CHANGING TO SNOW
IN RAIN MIXED WITH FREEZING RAIN
IN RAIN OR SNOW
IN RAIN SHOWERS
IN RAIN SHOWERS AND THUNDERSTORMS
IN RAIN SHOWERS OR THUNDERSTORMS
IN SCATTERED SHOWERS
IN SCATTERED SNOW SHOWERS
IN SCATTERED THUNDERSTORMS
IN SHOWERS
IN SHOWERS AND THUNDERSTORMS
IN SHOWERS OR THUNDERSTORMS
IN SNOW
IN SNOW FLURRIES
IN SNOW SHOWERS
IN THE VICINITY OF THUNDERSTORMS
IN THUNDERSTORMS
INTERMITTENT PRECIPITATION
INTERMITTENT RAIN
INTERMITTENT RAIN SHOWERS
INTERMITTENT SNOW
INTERMITTENT SNOW FLURRIES
ISOLATED EMBEDDED THUNDERSTORMS
ISOLATED SEVERE THUNDERSTORMS
ISOLATED THUNDERSTORMS
LIGHT DRIZZLE
LIGHT FREEZING RAIN
LIGHT ICE PELLET SHOWERS
LIGHT ICE PELLETS
LIGHT PRECIPITATION
LIGHT RAIN
LIGHT RAIN AND LIGHT SNOW
LIGHT RAIN, LIGHT SNOW AND ICE PELLETS
LIGHT RAIN SHOWERS
LIGHT RAIN SHOWERS AND SNOW SHOWERS
LIGHT SNOW
LIGHT SNOW AND ICE PELLETS
LIGHT SNOW FLURRIES
LIGHT SNOW SHOWERS
MIXED PRECIPITATION
MIXED PRECIPITATION - RAIN SNOW SLEET
NUMEROUS SHOWERS
NUMEROUS THUNDERSTORMS
OCCASIONAL DRIZZLE
OCCASIONAL EMBEDDED THUNDERSTORMS
OCCASIONAL LIGHT RAIN
OCCASIONAL LIGHT RAIN SHOWERS
OCCASIONAL LIGHT RAIN SHOWERS AND SNOW SHOWERS
OCCASIONAL LIGHT SNOW
OCCASIONAL PRECIPITATION
OCCASIONAL RAIN
OCCASIONAL RAIN SHOWERS
OCCASIONAL SEVERE THUNDERSTORMS
OCCASIONAL SNOW
OCCASIONAL SNOW FLURRIES
OCCASIONAL THUNDERSTORMS
POSSIBLE THUNDERSTORMS
POSSIBLE TORNADOS
POSSIBLY FORMING IN LINES AND CLUSTERS
PRECIPITATION
RAIN
RAIN AND SNOW
RAIN BEGAN
RAIN CHANGING TO SNOW
RAIN ENDED
RAIN MIXED WITH FREEZING RAIN
RAIN OR SNOW
RAIN SHOWER
RAIN SHOWERS
RAIN SHOWERS AND THUNDERSTORMS
RAIN SHOWERS OR THUNDERSTORMS
RAINFALL
SCATTERED EMBEDDED THUNDERSTORMS
SCATTERED RAIN SHOWERS
SCATTERED SEVERE THUNDERSTORMS
SCATTERED SHOWERS
SCATTERED SNOW SHOWERS
SCATTERED THUNDERSTORMS
SEVERE LOCAL STORMS
SEVERE THUNDERSTORM
SEVERE THUNDERSTORMS
SHOWER
SHOWERS
SHOWERS CHANGING TO FLURRIES
SHOWERS DEVELOPING
SLEET
SLEET SHOWERS
SLIGHT CHANCE OF HEAVY SNOW SHOWERS
SLIGHT CHANCE OF LIGHT SNOW SHOWERS
SLIGHT CHANCE OF SNOW SHOWERS

SMALL HAIL
SNOW
SNOW BEGAN
SNOW CHANGING TO RAIN
SNOW DEVELOPING
SNOW ENDED
SNOW FLURRIES
SNOW GRAINS
SNOW PELLETS
SNOW SHOWERS
SNOWFALL
SNOWFLAKE
SNOWING
SQUALL
SQUALL LINE
SQUALLS
STORM
STORMS
SUNSHINE
THUNDER
THUNDERHEAD
THUNDERSQUALLS
THUNDERSHOWER
THUNDERSHOWERS
THUNDERSTORM
THUNDERSTORM ACTIVITY SPREADING
THUNDERSTORM AND RAIN SHOWER
THUNDERSTORM DIMINISHING
THUNDERSTORM EXTENDING FROM
THUNDERSTORM POSSIBLY FORMING
THUNDERSTORMS
THUNDERSTORMS AND POSSIBLE TORNADOS
THUNDERSTORMS AND RAIN
THUNDERSTORMS AND RAIN SHOWERS
THUNDERSTORMS DEVELOPING
THUNDERSTORMS DIMINISHING
THUNDERSTORMS EXTENDING FROM
THUNDERSTORMS IN LINES AND CLUSTERS
THUNDERSTORMS POSSIBLY FORMING
TORNADO
TORNADOS
TROPICAL CYCLONE
TYPHOON
VERY LIGHT RAIN
VERY LIGHT RAIN SHOWERS
VERY LIGHT SNOW
VERY LIGHT SNOW SHOWERS
WATERSPOUT

LIGHTNING

LIGHTNING
LIGHTNING CLOUD-TO-CLOUD
LIGHTNING CLOUD-TO-CLOUD, CLOUD-TO-GROUND
LIGHTNING CLOUD-TO-GROUND
LIGHTNING CLOUD-TO-WATER
LIGHTNING IN CLOUDS

OBSTRUCTIONS TO VISION

BLOWING DUST
BLOWING SAND
BLOWING SNOW
BLOWING SPRAY
CHANCE OF EARLY MORNING FOG
CHANCE OF GROUND FOG AND SMOKE
CHANCE OF LOCAL MORNING GROUND FOG
CHANCE OF SOME HAZE
DENSE FOG
DUST
DUSTSTORM
DUSTSTORMS
EXTENSIVE FOG
FOG
FOG AND HAZE
FOG AND SMOKE
FOG BANK
FOG OFFSHORE
FREEZING FOG
GROUND FOG
GROUND FOG AND HAZE
GROUND FOG AND SMOKE
GROUND FOG ESTIMATED
HAZE
HAZE AND SMOKE
HAZE LAYER
HAZE LAYER ALOFT
HAZE LAYER ESTIMATED
HAZY
IN DUSTSTORM
IN DUSTSTORMS
IN FOG
IN GROUND FOG
IN HAZE
IN HAZE AND FOG
IN HAZE AND SMOKE
IN LOCAL MORNING FOG
IN MORNING HAZE
IN MORNING HAZE AND GROUND FOG
IN PATCHY FOG
IN RAIN AND FOG
IN SANDSTORMS
IN SMOKE
IN THICK HAZE
LIGHT FOG
LIGHT HAZE
OCCASIONAL FOG
OCCASIONAL GROUND FOG
PATCHES OF SHALLOW FOG NOT DEEPER THAN TWO METERS
PATCHY FOG
SANDSTORM
SMOKE
SMOKE LAYER ALOFT
SMOKE LAYER ESTIMATED
SMOKE OVER CITY
SMOKY
THICK HAZE
VARIABLE HAZE AND SMOKE
WIDESPREAD FOG
WIDESPREAD HAZE

WEATHER AND OBSTRUCTIONS TO VISION

DRIZZLE AND FOG
EMBEDDED IN HAZE
HEAVY RAIN AND FOG
HEAVY RAIN AND HAZE
HEAVY RAIN SHOWERS AND FOG
HEAVY RAIN SHOWERS AND HAZE
HEAVY SNOW AND BLOWING SNOW
HEAVY SNOW AND FOG
HEAVY SNOW SHOWERS AND BLOWING SNOW
ICE AND FOG
LIGHT RAIN AND FOG
LIGHT RAIN AND HAZE
LIGHT RAIN SHOWERS AND HAZE
LIGHT RAIN SHOWERS AND FOG
LIGHT SNOW AND BLOWING SNOW
LIGHT SNOW AND FOG
LIGHT SNOW AND HAZE
LIGHT SNOW SHOWERS AND BLOWING SNOW
RAIN AND FOG
RAIN AND HAZE
RAIN AND LIGHT FOG
RAIN SHOWERS AND HAZE
SNOW AND BLOWING SNOW
SNOW AND FOG
SNOW SHOWERS AND BLOWING SNOW

HEIGHT VALUES FOR SURFACE OBSERVATIONS

ONE HUNDRED
TWO HUNDRED
THREE HUNDRED
FOUR HUNDRED
FIVE HUNDRED
SIX HUNDRED
SEVEN HUNDRED
EIGHT HUNDRED
NINER HUNDRED
ONE THOUSAND
ONE THOUSAND ONE HUNDRED
ONE THOUSAND TWO HUNDRED
ONE THOUSAND THREE HUNDRED
ONE THOUSAND FOUR HUNDRED
ONE THOUSAND FIVE HUNDRED
ONE THOUSAND SIX HUNDRED
ONE THOUSAND SEVEN HUNDRED
ONE THOUSAND EIGHT HUNDRED
ONE THOUSAND NINE HUNDRED
TWO THOUSAND
TWO THOUSAND ONE HUNDRED
TWO THOUSAND TWO HUNDRED
TWO THOUSAND THREE HUNDRED
TWO THOUSAND FOUR HUNDRED
TWO THOUSAND FIVE HUNDRED
TWO THOUSAND SIX HUNDRED
TWO THOUSAND SEVEN HUNDRED
TWO THOUSAND EIGHT HUNDRED
TWO THOUSAND NINE HUNDRED
THREE THOUSAND
THREE THOUSAND ONE HUNDRED
THREE THOUSAND TWO HUNDRED
THREE THOUSAND THREE HUNDRED
THREE THOUSAND FOUR HUNDRED
THREE THOUSAND FIVE HUNDRED
THREE THOUSAND SIX HUNDRED
THREE THOUSAND SEVEN HUNDRED
THREE THOUSAND EIGHT HUNDRED
THREE THOUSAND NINE HUNDRED
FOUR THOUSAND
FOUR THOUSAND ONE HUNDRED
FOUR THOUSAND TWO HUNDRED
FOUR THOUSAND THREE HUNDRED
FOUR THOUSAND FOUR HUNDRED
FOUR THOUSAND FIVE HUNDRED
FOUR THOUSAND SIX HUNDRED
FOUR THOUSAND SEVEN HUNDRED
FOUR THOUSAND EIGHT HUNDRED
FOUR THOUSAND NINE HUNDRED
FIVE THOUSAND
FIVE THOUSAND FIVE HUNDRED
SIX THOUSAND
SIX THOUSAND FIVE HUNDRED
SEVEN THOUSAND
SEVEN THOUSAND FIVE HUNDRED
EIGHT THOUSAND
EIGHT THOUSAND FIVE HUNDRED
NINER THOUSAND
NINER THOUSAND FIVE HUNDRED
ONE ZERO THOUSAND
ONE ONE THOUSAND
ONE TWO THOUSAND
ONE THREE THOUSAND
ONE FOUR THOUSAND
ONE FIVE THOUSAND
ONE SIX THOUSAND
ONE SEVEN THOUSAND
ONE EIGHT THOUSAND
ONE NINER THOUSAND
TWO ZERO THOUSAND
TWO ONE THOUSAND
TWO TWO THOUSAND
TWO THREE THOUSAND
TWO FOUR THOUSAND
TWO FIVE THOUSAND
TWO SIX THOUSAND
TWO SEVEN THOUSAND
TWO EIGHT THOUSAND
TWO NINER THOUSAND
THREE ZERO THOUSAND
THREE FIVE THOUSAND
FOUR ZERO THOUSAND

TURBULENCE INTENSITY AND RANGE

BELOW ONE THOUSAND FEET
BETWEEN ONE THOUSAND AND TWO THOUSAND FEET
BETWEEN ONE THOUSAND AND THREE THOUSAND FEET
BETWEEN TWO THOUSAND AND THREE THOUSAND FEET
BETWEEN THREE THOUSAND AND FOUR THOUSAND FEET
BETWEEN THREE THOUSAND AND FIVE THOUSAND FEET
BETWEEN FOUR THOUSAND AND FIVE THOUSAND FEET
BETWEEN FIVE THOUSAND AND SIX THOUSAND FEET
BETWEEN FIVE THOUSAND AND SEVEN THOUSAND FEET
BETWEEN SIX THOUSAND AND SEVEN THOUSAND FEET
BETWEEN SEVEN THOUSAND AND EIGHT THOUSAND FEET
BETWEEN SEVEN THOUSAND AND NINER THOUSAND
BETWEEN EIGHT THOUSAND AND NINER THOUSAND
BETWEEN NINER THOUSAND AND TEN THOUSAND
BETWEEN NINER THOUSAND AND TWELVE THOUSAND
BETWEEN TEN THOUSAND AND ELEVEN THOUSAND FEET
BETWEEN ELEVEN THOUSAND AND TWELVE THOUSAND FEET
ABOVE TWELVE THOUSAND FEET

CLEAR AIR TURBULENCE
EXTREME TURBULENCE
LIGHT TURBULENCE
LIGHT TO MODERATE TURBULENCE
MODERATE TO SEVERE TURBULENCE
MODERATE TURBULENCE
OCCASIONAL EXTREME TURBULENCE
OCCASIONAL LIGHT TURBULENCE
OCCASIONAL MODERATE TURBULENCE
RISK OF SEVERE TURBULENCE
SEVERE TURBULENCE
TURBULENCE
LOW LEVEL WIND SHEAR
WIND SHEAR

PRESSURE SYSTEM FOR SYNOPSIS

DEEPENING LOW
HIGH PRESSURE BUILDING
HIGH PRESSURE SYSTEM
INTENSE LOW
LOW PRESSURE SYSTEM
LOW PRESSURE TROUGH
MODERATE HIGH PRESSURE SYSTEM
MODERATE RIDGE OF HIGH PRESSURE
RIDGE OF HIGH PRESSURE
STRONG HIGH PRESSURE SYSTEM
STRONG LOW PRESSURE SYSTEM
STRONG RIDGE OF HIGH PRESSURE
WEAK HIGH PRESSURE SYSTEM
WEAK LOW PRESSURE SYSTEM
WEAK RIDGE OF HIGH PRESSURE

PRESSURE TENDENCIES

PRESSURE FALLING
PRESSURE FALLING RAPIDLY
PRESSURE RISING
PRESSURE RISING RAPIDLY
PRESSURE STEADY
PRESSURE UNSTEADY

SKY CONDITION REMARKS

A FEW CUMULUS
A FEW CUMULUS CLOUDS
ABOVE CLOUDS
ALTOCUMULUS
ALTOCUMULUS CASTELLANOS
ALTOCUMULUS CLOUDS
ALTOSTRATUS
ALTOSTRATUS CLOUDS
BECOMING BROKEN
BECOMING OBSCURED
BECOMING OVERCAST
BELOW ALL CLOUDS
BETWEEN LAYERS
BREAKS IN HIGHER OVERCAST
BREAKS IN OVERCAST
BRIEF CEILING
BROKEN
BROKEN CLOUDS AT
BROKEN CLOUDS AT OR ABOVE
BROKEN CLOUD LAYERS
BROKEN OCCASIONALLY SCATTERED
BROKEN TO OVERCAST
BROKEN TO OVERCAST CLOUDS
BROKEN TO SCATTERED CLOUDS
BROKEN VARIABLE OVERCAST
BROKEN VARIABLE SCATTERED
BROKEN VARIABLE TO SCATTERED CLOUDS
CEILING RAGGED
CEILINGS AT OR ABOVE
CEILINGS AT OR BELOW
CEILINGS BECOMING UNLIMITED
CEILINGS BELOW
CEILINGS BETWEEN
CEILINGS BROKEN AT
CEILINGS BROKEN TO OVERCAST
CEILINGS FREQUENTLY AT OR BELOW
CEILINGS FREQUENTLY BELOW
CEILINGS GENERALLY
CEILINGS IMPROVING
CEILINGS LOCALLY
CEILINGS LOWERING
CEILINGS LOWERING TO AT OR BELOW
CEILINGS NEAR
CEILINGS OCCASIONALLY AT OR BELOW
CEILINGS OCCASIONALLY BELOW
CEILINGS OCCASIONALLY NEAR
CEILINGS OVERCAST
CEILINGS UNLIMITED
CEILINGS VARIABLE BETWEEN
CHANCE OF BRIEF CEILING
CHANCE OF CEILING
CHANCE OF INDEFINITE CEILING
CHANCE OF OCCASIONAL CEILING
CIRRO STRATUS
CIRRO STRATUS CLOUDS
CIRROCUMULUS
CIRROCUMULUS CLOUDS
CIRRUS
CIRRUS CLOUDS
CLEAR OF CLOUDS
CLEAR OR SCATTERED CLOUDS AND VISIBILITY
GREATER THAN TEN MILES
CLEAR SKIES
CLOUD
CLOUDIER
CLOUDINESS
CLOUDS
CUMULONIMBUS
CUMULONIMBUS MAMMATOS
CUMULONIMBUS TOPS
CUMULONIMBUS TOPS ABOVE
CUMULUS
CUMULUS CLOUDS
CUMULUS FRACTUS
CUMULUS FRACTUS CLOUDS
ESTIMATED CEILING
FEW ALTOCUMULUS
FEW CIRRUS
FEW CUMULUS
FEW SCATTERED
FEW STRATOCUMULUS
GRADUALLY CLEARING
HIGH CLOUDS VISIBLE
HIGHER BROKEN TO OVERCAST CLOUDS
HIGHER CLOUD LAYERS

HIGHER CLOUDS
IN AND OUT OF CLOUDS
IN CLOUD
IN CLOUDS
IN LOW STRATUS AND FOG
INCREASING HIGH CLOUDS
INDEFINITE CEILING
IN OVERCAST
IN THE OVERCAST
ISOLATED TOPS
LAYERS OCCASIONALLY BROKEN
LAYERS SCATTERED OCCASIONALLY BROKEN
LAYERS SCATTERED VARIABLE BROKEN
LOW STRATUS
LOWER BROKEN VARIABLE SCATTERED
MEASURED CEILING
MULTIPLE LAYERS WITH CEILINGS
NIMBOSTRATUS
OBSCURATION
OCCASIONAL BROKEN
OCCASIONAL CEILING
OCCASIONALLY BROKEN
OCCASIONALLY CEILING
OCCASIONALLY CEILING OVERCAST
OCCASIONALLY INDEFINITE CEILING
OVERCAST
PATCHY LOWER STRATUS
RADAR CEILING
SCATTERED CLOUDS
SCATTERED CUMULUS CLOUDS
SCATTERED OCCASIONALLY BROKEN
SCATTERED TO BROKEN
SCATTERED TO BROKEN CLOUDS
SCATTERED VARIABLE
SCATTERED VARIABLE BROKEN
SCATTERED VARIABLE BROKEN CLOUDS
SIGNIFICANT CLOUDS
SKIES
SKIES CLEARING
SKY
SKY CONDITIONS CLEAR
SKY CLEAR
SKY OBSCURED
SKY PARTIALLY OBSCURED
STANDING LENTICULAR ALTOCUMULUS CLOUDS
STANDING LENTICULAR CIRROCUMULUS CLOUDS
STANDING LENTICULAR STRATOCUMULUS CLOUDS
STRATIFORM
STRATOCUMULUS
STRATOCUMULUS CLOUDS
STRATUS
STRATUS CLOUDS
THIN BROKEN
THIN OVERCAST
THIN SCATTERED
TOP OF OVERCAST
TOWERING CUMULUS
VARIABLE BROKEN
VARIABLE CEILING
VARIABLE CLOUDS
VARIABLE OVERCAST
VARIABLE TO
VARIABLE TO CEILING

VFR/IFR CONDITION REMARKS

BECOMING IFR CEILING
BECOMING LOW IFR CEILING
BECOMING MARGINAL VFR
BECOMING MARGINAL VFR CEILING
BECOMING VFR
BECOMING VFR CEILING
BRIEF IFR CONDITION
BRIEF IFR CONDITIONS
IFR CEILING
IFR CONDITIONS
IFR VARIABLE
ISOLATED IFR CONDITIONS
LOW IFR CEILING
MARGINAL VFR
MARGINAL VFR BECOMING IFR CEILING
MARGINAL VFR CEILING
MARGINAL VFR CEILING BECOMING VFR
MARGINAL VFR VARIABLE IFR CEILING
SPREADING IFR CONDITIONS
VARIABLE IFR
VFR BECOMING CEILING
VFR BECOMING MARGINAL
VFR BECOMING MARGINAL VFR
VFR BECOMING MARGINAL VFR CEILING
VFR CEILING
VFR NOT RECOMMENDED

CONDITIONS

CONDITIONS BECOMING
CONDITIONS BRIEFLY LOWER
CONDITIONS CONTINUING BEYOND
CONDITIONS DEVELOPING
CONDITIONS DIMINISHING
CONDITIONS ENDING
CONDITIONS GENERALLY LIMITED
CONDITIONS GRADUALLY DEVELOPING
CONDITIONS GRADUALLY DIMINISHING
CONDITIONS GRADUALLY ENDING
CONDITIONS GRADUALLY IMPROVING
CONDITIONS GRADUALLY SPREADING
CONDITIONS IMPROVING
CONDITIONS MAINLY OVER
CONDITIONS MOVING
CONDITIONS OCCASIONALLY
CONDITIONS RAPIDLY DEVELOPING
CONDITIONS RAPIDLY DIMINISHING
CONDITIONS RAPIDLY ENDING
CONDITIONS RAPIDLY IMPROVING
CONDITIONS RAPIDLY SPREADING
CONDITIONS SLOWLY DEVELOPING
CONDITIONS SLOWLY DIMINISHING
CONDITIONS SLOWLY ENDING
CONDITIONS SLOWLY IMPROVING
CONDITIONS SLOWLY SPREADING
CONDITIONS SPREADING
CONDITIONS UNLIMITED
CONDITIONS VARIABLE TO BELOW

BASE OF CLOUD DECK

BASES BELOW ONE THOUSAND
BASES AT OR BELOW ONE THOUSAND
BASES BETWEEN ONE THOUSAND AND TWO THOUSAND
BASES BETWEEN ONE THOUSAND AND THREE THOUSAND
BASES BETWEEN TWO THOUSAND AND THREE THOUSAND
BASES BETWEEN ONE THOUSAND FIVE HUNDRED AND TWO THOUSAND FIVE HUNDRED
BASES BETWEEN THREE THOUSAND AND FIVE THOUSAND
BASES BETWEEN FOUR THOUSAND AND SIX THOUSAND
BASES BETWEEN FIVE THOUSAND AND SEVEN THOUSAND
BASES BETWEEN SIX THOUSAND AND EIGHT THOUSAND
BASES BETWEEN SEVEN THOUSAND AND NINE THOUSAND
BASES BETWEEN EIGHT THOUSAND AND TEN THOUSAND
BASES BETWEEN TEN THOUSAND AND FIFTEEN THOUSAND
BASES BETWEEN ELEVEN THOUSAND AND SIXTEEN THOUSAND
BASES BETWEEN TWELVE THOUSAND AND SEVENTEEN THOUSAND
BASES BETWEEN THIRTEEN THOUSAND AND EIGHTEEN THOUSAND
BASES BETWEEN FOURTEEN THOUSAND AND NINETEEN THOUSAND
BASES BETWEEN FIFTEEN THOUSAND AND TWENTY THOUSAND
BASES BETWEEN SIXTEEN THOUSAND AND TWENTY-ONE THOUSAND
BASES BETWEEN SEVENTEEN THOUSAND AND TWENTY-TWO THOUSAND
BASES BETWEEN EIGHTEEN THOUSAND AND TWENTY-THREE THOUSAND
BASES BETWEEN NINETEEN THOUSAND AND TWENTY-FOUR THOUSAND
BASES BETWEEN TWENTY THOUSAND AND TWENTY-FIVE THOUSAND

CLOUD BASES - REMARKS

BASE OF OVERCAST
BROKEN BASES
BROKEN TO OVERCAST BASES
MOUNTAIN PASSES OBSCURED
MOUNTAIN RIDGES OBSCURED
MOUNTAIN TOPS OBSCURED
LOWER CLOUDS COASTAL REGIONS
LOWER COASTAL STRATUS
LOWER SCATTERED CLOUDS
OVERCAST BASES
SCATTERED BASES
SCATTERED TO BROKEN BASES

RANGE OF TOPS

TOPS BETWEEN ONE THOUSAND AND TWO THOUSAND
TOPS BETWEEN TWO THOUSAND AND THREE THOUSAND
TOPS BETWEEN ONE THOUSAND AND THREE THOUSAND
TOPS BETWEEN ONE THOUSAND FIVE HUNDRED AND TWO THOUSAND FIVE HUNDRED
TOPS BETWEEN THREE THOUSAND AND FIVE THOUSAND
TOPS BETWEEN FOUR THOUSAND AND SIX THOUSAND
TOPS BETWEEN FIVE THOUSAND AND SEVEN THOUSAND
TOPS BETWEEN SIX THOUSAND AND EIGHT THOUSAND
TOPS BETWEEN SEVEN THOUSAND AND NINE THOUSAND
TOPS BETWEEN EIGHT THOUSAND AND TEN THOUSAND
TOPS BETWEEN TEN THOUSAND AND TWELVE THOUSAND
TOPS BETWEEN TEN THOUSAND AND THIRTEEN THOUSAND
TOPS BETWEEN TEN THOUSAND AND FOURTEEN THOUSAND
TOPS BETWEEN TEN THOUSAND AND FIFTEEN THOUSAND
TOPS BETWEEN ELEVEN THOUSAND AND THIRTEEN THOUSAND
TOPS BETWEEN ELEVEN THOUSAND AND FOURTEEN THOUSAND
TOPS BETWEEN ELEVEN THOUSAND AND FIFTEEN THOUSAND
TOPS BETWEEN ELEVEN THOUSAND AND SIXTEEN THOUSAND
TOPS BETWEEN TWELVE THOUSAND AND FOURTEEN THOUSAND
TOPS BETWEEN TWELVE THOUSAND AND FIFTEEN THOUSAND

TOPS BETWEEN TWELVE THOUSAND AND SIXTEEN THOUSAND
TOPS BETWEEN TWELVE THOUSAND AND SEVENTEEN THOUSAND
TOPS BETWEEN THIRTEEN THOUSAND AND FIFTEEN THOUSAND
TOPS BETWEEN THIRTEEN THOUSAND AND SIXTEEN THOUSAND
TOPS BETWEEN THIRTEEN THOUSAND AND SEVENTEEN THOUSAND
TOPS BETWEEN THIRTEEN THOUSAND AND EIGHTEEN THOUSAND
TOPS BETWEEN FOURTEEN THOUSAND AND SIXTEEN THOUSAND
TOPS BETWEEN FOURTEEN THOUSAND AND SEVENTEEN THOUSAND
TOPS BETWEEN FOURTEEN THOUSAND AND EIGHTEEN THOUSAND
TOPS BETWEEN FOURTEEN THOUSAND AND NINETEEN THOUSAND
TOPS BETWEEN FIFTEEN THOUSAND AND SEVENTEEN THOUSAND
TOPS BETWEEN FIFTEEN THOUSAND AND EIGHTEEN THOUSAND
TOPS BETWEEN FIFTEEN THOUSAND AND NINETEEN THOUSAND
TOPS BETWEEN FIFTEEN THOUSAND AND TWENTY THOUSAND
TOPS BETWEEN SIXTEEN THOUSAND AND EIGHTEEN THOUSAND
TOPS BETWEEN SIXTEEN THOUSAND AND NINETEEN THOUSAND
TOPS BETWEEN SIXTEEN THOUSAND AND TWENTY THOUSAND
TOPS BETWEEN SIXTEEN THOUSAND AND TWENTY-ONE THOUSAND
TOPS BETWEEN SEVENTEEN THOUSAND AND NINETEEN THOUSAND
TOPS BETWEEN SEVENTEEN THOUSAND AND TWENTY THOUSAND
TOPS BETWEEN SEVENTEEN THOUSAND AND TWENTY-ONE THOUSAND
TOPS BETWEEN SEVENTEEN THOUSAND AND TWENTY-TWO THOUSAND
TOPS BETWEEN EIGHTEEN THOUSAND AND TWENTY THOUSAND
TOPS BETWEEN EIGHTEEN THOUSAND AND TWENTY-ONE THOUSAND
TOPS BETWEEN EIGHTEEN THOUSAND AND TWENTY-TWO THOUSAND
TOPS BETWEEN EIGHTEEN THOUSAND AND TWENTY-THREE THOUSAND
TOPS BETWEEN NINETEEN THOUSAND AND TWENTY-ONE THOUSAND
TOPS BETWEEN NINETEEN THOUSAND AND TWENTY-TWO THOUSAND
TOPS BETWEEN NINETEEN THOUSAND AND TWENTY-THREE THOUSAND
TOPS BETWEEN NINETEEN THOUSAND AND TWENTY-FOUR THOUSAND
TOPS BETWEEN TWENTY THOUSAND AND TWENTY-TWO THOUSAND
TOPS BETWEEN TWENTY THOUSAND AND TWENTY-THREE THOUSAND
TOPS BETWEEN TWENTY THOUSAND AND TWENTY-FOUR THOUSAND
TOPS BETWEEN TWENTY THOUSAND AND TWENTY-FIVE THOUSAND
TOPS BETWEEN TWENTY-ONE THOUSAND AND TWENTY-THREE THOUSAND
TOPS BETWEEN TWENTY-ONE THOUSAND AND TWENTY-FOUR THOUSAND
TOPS BETWEEN TWENTY-ONE THOUSAND AND TWENTY-FIVE THOUSAND
TOPS BETWEEN TWENTY-THREE THOUSAND AND TWENTY-FIVE THOUSAND
TOPS BETWEEN TWENTY-TWO THOUSAND AND TWENTY-FOUR THOUSAND
TOPS BETWEEN TWENTY-TWO THOUSAND AND TWENTY-FIVE THOUSAND
TOPS BETWEEN TWENTY-THREE THOUSAND AND TWENTY-FIVE THOUSAND

CLOUD TOP - REMARKS

LAYER
LAYERED
LAYERS
MERGING LAYERS
CONVECTIVE
MULTIPLE LAYERS
TOPS
TOPS BELOW
TOPS AT OR BELOW
MERGING LAYERS TO
MERGING LAYERS TO BETWEEN
TOPS BETWEEN
TOPS OVER
ISOLATED TOPS
MAXIMUM TOPS

RANGE OF CEILINGS

CEILINGS BELOW ONE THOUSAND
CEILINGS AT OR BELOW ONE THOUSAND
CEILINGS BETWEEN ONE THOUSAND AND TWO THOUSAND
CEILINGS BETWEEN ONE THOUSAND AND TWO THOUSAND FIVE HUNDRED
CEILINGS BETWEEN ONE THOUSAND FIVE HUNDRED AND TWO THOUSAND FIVE HUNDRED
CEILINGS BETWEEN ONE THOUSAND AND THREE THOUSAND
CEILINGS BETWEEN TWO THOUSAND AND THREE THOUSAND
CEILINGS BETWEEN THREE THOUSAND AND FIVE THOUSAND
CEILINGS BETWEEN FOUR THOUSAND AND SIX THOUSAND
CEILINGS BETWEEN FIVE THOUSAND AND SEVEN THOUSAND
CEILINGS BETWEEN SIX THOUSAND AND EIGHT THOUSAND
CEILINGS BETWEEN SEVEN THOUSAND AND NINE THOUSAND
CEILINGS BETWEEN EIGHT THOUSAND AND TEN THOUSAND
CEILINGS BETWEEN TEN THOUSAND AND FIFTEEN THOUSAND
CEILINGS BETWEEN ELEVEN THOUSAND AND SIXTEEN THOUSAND
CEILINGS BETWEEN TWELVE THOUSAND AND SEVENTEEN THOUSAND
CEILINGS BETWEEN THIRTEEN THOUSAND AND EIGHTEEN THOUSAND
CEILINGS BETWEEN FOURTEEN THOUSAND AND NINETEEN THOUSAND
CEILINGS BETWEEN FIFTEEN THOUSAND AND TWENTY THOUSAND
CEILINGS BETWEEN SIXTEEN THOUSAND AND TWENTY-ONE THOUSAND
CEILINGS BETWEEN SEVENTEEN THOUSAND AND TWENTY-TWO THOUSAND
CEILINGS BETWEEN EIGHTEEN THOUSAND AND TWENTY-THREE THOUSAND
CEILINGS BETWEEN NINETEEN THOUSAND AND TWENTY-FOUR THOUSAND
CEILINGS BETWEEN TWENTY THOUSAND AND TWENTY-FIVE THOUSAND

CEILINGS AND VISIBILITIES CONCURRENTLY

CEILINGS AND VISIBILITIES
CEILINGS AND VISIBILITIES AT OR BELOW
CEILINGS AND VISIBILITIES BELOW
CEILINGS AND VISIBILITIES FREQUENTLY BELOW
CEILINGS AND VISIBILITIES FREQUENTLY VARIABLE AT OR BELOW
CEILINGS AND VISIBILITIES LOCALLY
CEILINGS AND VISIBILITIES LOWERING
CEILINGS AND VISIBILITIES NEAR
CEILINGS AND VISIBILITIES OCCASIONALLY BELOW
CEILINGS AND VISIBILITIES OCCASIONALLY VARIABLE AT OR BELOW
CEILINGS UNLIMITED
CEILINGS AND VISIBILITIES VARIABLE TO BELOW
LOWERING CEILINGS AND VISIBILITIES TO AT OR ABOUT
VISIBILITIES UNRESTRICTED

ICING INTENSITY AND TYPE

CLEAR ICING
MIXED ICING
RIME ICING
LIGHT CLEAR ICING
LIGHT MIXED ICING
LIGHT RIME ICING
LIGHT TO MODERATE CLEAR ICING
LIGHT TO MODERATE MIXED ICING
LIGHT TO MODERATE RIME ICING
MODERATE CLEAR ICING
MODERATE MIXED ICING
MODERATE RIME ICING
MODERATE TO SEVERE CLEAR ICING
MODERATE TO SEVERE MIXED ICING
MODERATE TO SEVERE RIME ICING
SEVERE CLEAR ICING
SEVERE MIXED ICING
SEVERE RIME ICING

TRACE OF CLEAR ICING
TRACE OF MIXED ICING
TRACE OF RIME ICING

ICE FOG
ICING IN CLOUDS
ICING IN CLOUDS AND IN PRECIPITATION
ICING IN PRECIPITATION
RIME

FREEZING LEVEL

FREEZING LEVEL AT OR NEAR SURFACE
FREEZING LEVEL BELOW ONE THOUSAND FEET
FREEZING LEVEL BETWEEN ONE THOUSAND AND TWO THOUSAND FEET
FREEZING LEVEL BETWEEN TWO THOUSAND AND THREE THOUSAND FEET
FREEZING LEVEL BETWEEN THREE THOUSAND AND FOUR THOUSAND FEET
FREEZING LEVEL BETWEEN FOUR THOUSAND AND FIVE THOUSAND FEET
FREEZING LEVEL BETWEEN FIVE THOUSAND AND SIX THOUSAND FEET
FREEZING LEVEL BETWEEN SIX THOUSAND AND SEVEN THOUSAND FEET
FREEZING LEVEL BETWEEN SEVEN THOUSAND AND EIGHT THOUSAND FEET
FREEZING LEVEL BETWEEN EIGHT THOUSAND AND NINE THOUSAND FEET
FREEZING LEVEL BETWEEN NINE THOUSAND AND TEN THOUSAND FEET
FREEZING LEVEL BETWEEN TEN THOUSAND AND ELEVEN THOUSAND FEET
FREEZING LEVEL BETWEEN ELEVEN THOUSAND AND TWELVE THOUSAND FEET
FREEZING LEVEL ABOVE TWELVE THOUSAND FEET

FRONT

AHEAD OF THE FRONT
BEHIND THE FRONT
BEHIND THE COLD FRONT
COLD FRONT
COLD FRONTAL PASSAGE
COLD OCCLUDED FRONT
FRONT
FRONTS
FRONTAL
FRONTAL PASSAGE
FRONTAL SURFACE
MODERATE COLD FRONT
MODERATE OCCLUDED FRONT
MODERATE WARM FRONT
NEAR COLD FRONT
OCCLUDED FRONT
OCCLUDED FRONTAL PASSAGE
QUASISTATIONARY
STATIONARY FRONT
STRONG COLD FRONT
STRONG OCCLUDED FRONT
STRONG WARM FRONT
WARM FRONT
WARM FRONTAL PASSAGE
WARM OCCLUDED FRONT
WEAK COLD FRONT
WEAK OCCLUDED FRONT
WEAK STATIONARY FRONT
WEAK WARM FRONT

RUNWAY NUMBERS

RUNWAY ONE
RUNWAY ONE LEFT
RUNWAY ONE RIGHT
RUNWAY ONE CENTER
RUNWAY TWO
RUNWAY TWO LEFT
RUNWAY TWO RIGHT
RUNWAY TWO CENTER
RUNWAY THREE
RUNWAY THREE LEFT
RUNWAY THREE RIGHT
RUNWAY THREE CENTER
RUNWAY FOUR
RUNWAY FOUR LEFT
RUNWAY FOUR RIGHT
RUNWAY FOUR CENTER
RUNWAY FIVE
RUNWAY FIVE LEFT
RUNWAY FIVE RIGHT
RUNWAY FIVE CENTER
RUNWAY SIX
RUNWAY SIX LEFT
RUNWAY SIX RIGHT
RUNWAY SIX CENTER
RUNWAY SEVEN
RUNWAY SEVEN LEFT
RUNWAY SEVEN RIGHT
RUNWAY SEVEN CENTER
RUNWAY EIGHT
RUNWAY EIGHT LEFT
RUNWAY EIGHT RIGHT
RUNWAY EIGHT CENTER
RUNWAY NINER
RUNWAY NINER LEFT
RUNWAY NINER RIGHT
RUNWAY NINER CENTER
RUNWAY ONE ZERO
RUNWAY ONE ZERO LEFT
RUNWAY ONE ZERO RIGHT
RUNWAY ONE ZERO CENTER
RUNWAY ONE ONE
RUNWAY ONE ONE LEFT
RUNWAY ONE ONE RIGHT
RUNWAY ONE ONE CENTER
RUNWAY ONE TWO
RUNWAY ONE TWO LEFT
RUNWAY ONE TWO RIGHT
RUNWAY ONE TWO CENTER
RUNWAY ONE THREE
RUNWAY ONE THREE LEFT
RUNWAY ONE THREE RIGHT
RUNWAY ONE THREE CENTER
RUNWAY ONE FOUR
RUNWAY ONE FOUR LEFT
RUNWAY ONE FOUR RIGHT
RUNWAY ONE FOUR CENTER
RUNWAY ONE FIVE
RUNWAY ONE FIVE LEFT
RUNWAY ONE FIVE RIGHT
RUNWAY ONE FIVE CENTER
RUNWAY ONE SIX
RUNWAY ONE SIX LEFT
RUNWAY ONE SIX RIGHT
RUNWAY ONE SIX CENTER
RUNWAY ONE SEVEN
RUNWAY ONE SEVEN LEFT
RUNWAY ONE SEVEN RIGHT
RUNWAY ONE SEVEN CENTER
RUNWAY ONE EIGHT
RUNWAY ONE EIGHT LEFT
RUNWAY ONE EIGHT RIGHT
RUNWAY ONE EIGHT CENTER
RUNWAY ONE NINER
RUNWAY ONE NINER LEFT
RUNWAY ONE NINER RIGHT
RUNWAY ONE NINER CENTER
RUNWAY TWO ZERO
RUNWAY TWO ZERO LEFT
RUNWAY TWO ZERO RIGHT
RUNWAY TWO ZERO CENTER
RUNWAY TWO ONE
RUNWAY TWO ONE LEFT
RUNWAY TWO ONE RIGHT
RUNWAY TWO ONE CENTER
RUNWAY TWO TWO
RUNWAY TWO TWO LEFT
RUNWAY TWO TWO RIGHT
RUNWAY TWO TWO CENTER
RUNWAY TWO THREE
RUNWAY TWO THREE LEFT
RUNWAY TWO THREE RIGHT
RUNWAY TWO THREE CENTER
RUNWAY TWO FOUR
RUNWAY TWO FOUR LEFT
RUNWAY TWO FOUR RIGHT
RUNWAY TWO FOUR CENTER
RUNWAY TWO FIVE
RUNWAY TWO FIVE LEFT
RUNWAY TWO FIVE RIGHT
RUNWAY TWO FIVE CENTER
RUNWAY TWO SIX
RUNWAY TWO SIX LEFT
RUNWAY TWO SIX RIGHT
RUNWAY TWO SIX CENTER
RUNWAY TWO SEVEN
RUNWAY TWO SEVEN LEFT
RUNWAY TWO SEVEN RIGHT
RUNWAY TWO SEVEN CENTER
RUNWAY TWO EIGHT
RUNWAY TWO EIGHT LEFT
RUNWAY TWO EIGHT RIGHT
RUNWAY TWO EIGHT CENTER
RUNWAY TWO NINER
RUNWAY TWO NINER LEFT
RUNWAY TWO NINER RIGHT
RUNWAY TWO NINER CENTER
RUNWAY THREE ZERO
RUNWAY THREE ZERO LEFT
RUNWAY THREE ZERO RIGHT
RUNWAY THREE ZERO CENTER
RUNWAY THREE ONE
RUNWAY THREE ONE LEFT
RUNWAY THREE ONE RIGHT
RUNWAY THREE ONE CENTER
RUNWAY THREE TWO
RUNWAY THREE TWO LEFT
RUNWAY THREE TWO RIGHT
RUNWAY THREE TWO CENTER
RUNWAY THREE THREE
RUNWAY THREE THREE LEFT
RUNWAY THREE THREE RIGHT
RUNWAY THREE THREE CENTER
RUNWAY THREE FOUR
RUNWAY THREE FOUR LEFT
RUNWAY THREE FOUR RIGHT
RUNWAY THREE FOUR CENTER

RUNWAY THREE FIVE
RUNWAY THREE FIVE LEFT
RUNWAY THREE FIVE RIGHT
RUNWAY THREE FIVE CENTER
RUNWAY THREE SIX
RUNWAY THREE SIX LEFT
RUNWAY THREE SIX RIGHT
RUNWAY THREE SIX CENTER

RUNWAY SURFACE

ASPHALT
CONCRETE
DIRT
GRAVEL
SOD

BRAKING ACTION

BRAKING ACTION FAIR
BRAKING ACTION GOOD
BRAKING ACTION NIL
BRAKING ACTION POOR

RUNWAY CONDITIONS

CLEARED AND DRY
CLEARED OF SOFT SNOW
COMPACTED SNOW
DRIFTING SNOW
DRY SNOW
FROZEN RIDGES
FROZEN RUTS
ICE ON RUNWAY
ICE ON RUNWAYS
LOOSE SNOW ON RUNWAY
LOOSE SNOW ON RUNWAYS
PACKED SNOW ON RUNWAY
PACKED SNOW ON RUNWAYS
PARTIALLY CLEARED
PARTIALLY CLEARED DRY SNOW
PARTIALLY CLEARED ICE
PARTIALLY CLEARED SLUSH
PARTIALLY CLEARED WET SNOW
PATCHES OF DRY SNOW
PATCHES OF ICE
PATCHES OF SLUSH
PATCHES OF WET SNOW
PLOW
PLOWED
PLOWING
ROLLED SNOW
RUNWAY SANDED
RUNWAYS SANDED
SANDED
SANDING
SANDING IS IN PROGRESS
SLUSH
SLUSH ON RUNWAY
SLUSH ON RUNWAYS
SNOW AND ICE ON RUNWAY
SNOW AND ICE ON RUNWAYS
SNOW CLEARANCE COMPLETED
SNOW CLEARANCE IN PROGRESS
SNOW ON RUNWAY
SNOW ON RUNWAYS
SNOWBANK
STANDING WATER
THIN ICE
WET RUNWAY
WET RUNWAYS
WET SNOW
WET SNOW ON RUNWAY
WET SNOW ON RUNWAYS

LIGHTS

AIRPORT BEACON
AIRPORT LIGHTING SYSTEM
AIRPORT LIGHTS
ALL LANDING AREA LIGHTING FACILITIES
APPROACH LIGHTING SYSTEM
BOUNDARY LIGHTS
CENTERLINE
GREEN
HAZARD BEACON
HIGH INTENSITY RUNWAY LIGHTS
IDENTIFICATION BEACON
LEAD IN LIGHTS
LIGHT INTENSITY HIGH
LIGHT INTENSITY LOW
LIGHT INTENSITY MEDIUM
LIGHTED
LIGHTED AT NIGHT
LIGHTING
LIGHTS
LIT
LOW INTENSITY RUNWAY EDGE LIGHTS
MARINE LIGHT BEACON
MEDIUM INTENSITY APPROACH LIGHT SYSTEM
MEDIUM INTENSITY APPROACH LIGHT SYSTEM WITH THREE SEQUENCED FLASHERS
MEDIUM INTENSITY RUNWAY EDGE LIGHTS
OBSTRUCTION LIGHTS
PILOT CONTROLLED LIGHTING
RANGE LIGHTS
RUNWAY ALIGNMENT INDICATOR LIGHTS
RUNWAY CENTERLINE LIGHTS
RUNWAY EDGE LIGHTS
RUNWAY END IDENTIFIER LIGHT
RUNWAY END IDENTIFIER LIGHTS
RUNWAY LIGHTS
RUNWAY REMAINING LIGHTS
SEQUENCE FLASHING LIGHTS
SHORT APPROACH LIGHTING SYSTEM
STOPWAY LIGHTS
TAXIING GUIDANCE SYSTEM
TAXIWAY CENTERLINE LIGHTS
TAXIWAY EDGE LIGHTS
THRESHOLD LIGHTS
TOUCHDOWN ZONE LIGHTS
TURNOFF LIGHTS
UNLIGHTED
VISUAL APPROACH SLOPE INDICATOR

NAVIGATIONAL AIDS

AIR ROUTE SURVEILLANCE RADAR
AIRPORT SURVEILLANCE RADAR
AUTOMATIC DIRECTION FINDER
BACK COURSE
BACK COURSE MARKER
BALLOON
BAROMETER
BEACON
COMPASS LOCATOR
COMPASS LOCATOR AT MIDDLE MARKER
DIRECTION FINDER
DISTANCE MEASURING EQUIPMENT
GLIDE PATH
GLIDE SLOPE
GROUND CONTROLLED APPROACH SYSTEM
INNER MARKER
INSTRUMENT LANDING SYSTEM
LANDING DIRECTION INDICATOR
LOCALIZER
LOCATOR
MICROWAVE LANDING SYSTEM
MIDDLE MARKER
NAVIGATIONAL AID
NON-DIRECTIONAL RADIO BEACON
OUTER MARKER
PLAN POSITION INDICATOR
PRECISION APPROACH RADAR
PRECISION INSTRUMENT RUNWAY
SECONDARY SURVEILLANCE RADAR
STATION LOCATION MARKER VHF
SURFACE MOVEMENT RADAR
TACAN
TERMINAL AREA SURVEILLANCE RADAR
UHF DIRECTION FINDER
VOR
VOR/DME
VOR RECEIVER TESTING FACILITY
VORTAC

INTRODUCTORY SEGMENT

THIS IS THE NATIONAL WEATHER SERVICE OFFICE AT LA GUARDIA AIRPORT WITH A RECORDING OF AVIATION WEATHER FOR

ROUTE

NEW YORK CITY AND A RADIUS OF FIFTY MILES
ROUTES EAST FROM NEW YORK CITY
ROUTES NORTH FROM NEW YORK CITY
ROUTES SOUTH FROM NEW YORK CITY
ROUTES WEST FROM NEW YORK CITY
NEW YORK CITY TO ALBANY TO BURLINGTON
NEW YORK CITY TO BLOCK ISLAND TO NANTUCKET
NEW YORK CITY TO BRADLEY TO BOSTON
NEW YORK CITY TO ELMIRA TO BUFFALO
NEW YORK CITY TO PHILADELPHIA TO WASHINGTON

AREA FOR WINDS ALOFT FORECAST

THE ALBANY AREA
THE BOSTON AREA
WESTMINSTER

TIME FOR WINDS ALOFT FORECAST

FOR THIS AFTERNOON IS
FOR THIS MORNING IS
FOR TOMORROW MORNING IS
FOR TONIGHT IS

HEIGHT FOR WINDS ALOFT FORECAST

AT THREE THOUSAND FEET
AT SIX THOUSAND FEET
AT NINE THOUSAND FEET
AT TWELVE THOUSAND FEET

DATE-TIME GROUP

ZERO ZERO ZERO ZERO
ZERO ONE ZERO ZERO
ZERO TWO ZERO ZERO
ZERO THREE ZERO ZERO
ZERO FOUR ZERO ZERO
ZERO FIVE ZERO ZERO
ZERO SIX ZERO ZERO
ZERO SEVEN ZERO ZERO
ZERO EIGHT ZERO ZERO
ZERO NINE ZERO ZERO
ONE ZERO ZERO ZERO
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MIDNIGHT
ONE AM
TWO AM
THREE AM
FOUR AM
FIVE AM
SIX AM
SEVEN AM

EIGHT AM
NINE AM
TEN AM
ELEVEN AM
TWELVE NOON
ONE PM
TWO PM
THREE PM
FOUR PM
FIVE PM
SIX PM
SEVEN PM
EIGHT PM
NINE PM
TEN PM
ELEVEN PM

AFTER DARK
AFTER MIDNIGHT
AFTERNOON
ALL DAY
AM
BEFORE DARK
BEFORE MIDNIGHT
BY AFTERNOON
BY DAYBREAK
BY DAYLIGHT
BY EARLY AFTERNOON
BY EARLY EVENING
BY EARLY MORNING
BY EVENING
BY LATE AFTERNOON
BY LATE EVENING
BY LATE MORNING
BY LATE TONIGHT
BY MID AFTERNOON
BY MID MORNING
BY MIDNIGHT
BY MORNING
BY NIGHT
BY NOON
BY SUNRISE
BY SUNSET
BY THIS AFTERNOON
BY THIS EVENING
BY THIS MORNING
BY TOMORROW
BY TONIGHT
DARK
DATE
DAY
DAYBREAK
DAYLIGHT
DURING THE AFTERNOON
DURING THE DAY
DURING THE EVENING
DURING THE MORNING
EARLY AFTERNOON
EARLY EVENING
EARLY MORNING
EVENING
FORENOON
GREENWICH MEAN TIME
HOUR
HOURS
HOURS AFTER SUNRISE
LATE AFTERNOON
LATE EVENING
LATE MORNING
LATE TONIGHT
LOCAL TIME
MID AFTERNOON
MID MORNING
MINUTE
MINUTES
MONTH
MORNING
NEAR SUNRISE
NIGHT
NOON
OVERNIGHT
PM
SUNRISE
SUNSET
THIS AFTERNOON
THIS AFTERNOON AND EVENING
THIS MORNING
THROUGH THE DAY
TIME
TODAY
TOMORROW
TONIGHT
TWILIGHT
UNTIL MIDNIGHT
WEEK
WEEKDAYS
WEEKEND

JANUARY
FEBRUARY
MARCH
APRIL
MAY
JUNE
JULY
AUGUST
SEPTEMBER
OCTOBER
NOVEMBER
DECEMBER
FIRST
SECOND
THIRD
FOURTH
FIFTH
SIXTH
SEVENTH
EIGHTH
NINTH
TENTH
ELEVENTH
TWELFTH
THIRTEENTH
FOURTEENTH
FIFTEENTH
SIXTEENTH
SEVENTEENTH
EIGHTEENTH
NINETEENTH
TWENTIETH
TWENTY-FIRST
TWENTY-SECOND
TWENTY-THIRD
TWENTY-FOURTH
TWENTY-FIFTH
TWENTY-SIXTH

TWENTY-SEVENTH
TWENTY-EIGHTH
TWENTY-NINTH
THIRTIETH
THIRTY-FIRST

SUNDAY
MONDAY
TUESDAY
WEDNESDAY
THURSDAY
FRIDAY
SATURDAY

ZERO ONE HUNDRED
ZERO TWO HUNDRED
ZERO THREE HUNDRED
ZERO FOUR HUNDRED
ZERO FIVE HUNDRED
ZERO SIX HUNDRED
ZERO SEVEN HUNDRED
ZERO EIGHT HUNDRED
ZERO NINE HUNDRED
TEN HUNDRED
ELEVEN HUNDRED
TWELVE HUNDRED
THIRTEEN HUNDRED
FOURTEEN HUNDRED
FIFTEEN HUNDRED
SIXTEEN HUNDRED
SEVENTEEN HUNDRED
EIGHTEEN HUNDRED
NINETEEN HUNDRED
TWENTY HUNDRED
TWENTY ONE HUNDRED
TWENTY TWO HUNDRED
TWENTY THREE HUNDRED
TWENTY FOUR HUNDRED

DIRECTION

EAST
EAST NORTHEAST
EAST NORTHEASTERLY
EAST NORTHEASTERN
EAST NORTHEASTWARD
EAST SOUTHEAST
EAST SOUTHEASTERLY
EAST SOUTHEASTERN
EAST SOUTHEASTWARD
EAST TO NORTH
EAST TO NORTHEAST
EAST TO NORTHWEST
EAST TO SOUTH
EAST TO SOUTHEAST
EAST TO SOUTHWEST
EAST TO WEST
EASTBOUND
EASTERLY
EASTERN
EASTWARD
NORTH
NORTH NORTHEAST
NORTH NORTHEASTERLY
NORTH NORTHEASTERN
NORTH NORTHEASTWARD
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NORTH NORTHWESTERLY
NORTH NORTHWESTERN
NORTH NORTHWESTWARD
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WEST SOUTHWESTERLY
WEST SOUTHWESTERN
WEST SOUTHWESTWARD
WEST TO EAST
WEST TO NORTH
WEST TO NORTHEAST
WEST TO NORTHWEST
WEST TO SOUTH
WEST TO SOUTHEAST
WEST TO SOUTHWEST
WESTBOUND
WESTERLY
WESTERN
WESTWARD

LOCATION AND GEOGRAPHY

ADIRONDACK
ADIRONDACK MOUNTAINS
ALABAMA
ALASKA
ALBANY
ALLEGHENY
ALLEGHENY MOUNTAINS
ALLENTOWN
ALTOONA
APPALACHIAN
APPALACHIAN MOUNTAINS
ARIZONA
ARKANSAS
ATLANTIC
BALTIMORE
BINGHAMTON
BLOCK ISLAND
BOSTON
BRADLEY
BRIDGEPORT
BUFFALO
BURLINGTON
CALIFORNIA
CANADA
CAPE COD
CATSKILL MOUNTAINS
CENTRAL CONNECTICUT
CENTRAL MAINE
CENTRAL MASSACHUSETTS
CENTRAL NEW HAMPSHIRE
CENTRAL NEW YORK
CENTRAL SOUTH CAROLINA
CENTRAL VERMONT
CHAMPLAIN VALLEY
CHESAPEAKE
COASTAL SECTION OF MAINE
COLORADO
COLTS NECK
CONNECTICUT
CONTINENTAL DIVIDE
DEER PARK
DELAWARE
EAST CENTRAL OHIO
EASTERN CONNECTICUT
EASTERN DELAWARE
EASTERN MAINE
EASTERN MARYLAND
EASTERN MASSACHUSETTS
EASTERN NEW HAMPSHIRE
EASTERN NEW JERSEY
EASTERN NEW YORK
EASTERN NORTH CAROLINA
EASTERN OHIO
EASTERN PART OF WESTERN NEW YORK
EASTERN PENNSYLVANIA
EASTERN RHODE ISLAND
EASTERN SHORE OF MARYLAND
EASTERN SOUTH CAROLINA
EASTERN VERMONT
EASTERN VIRGINIA
EASTERN WEST VIRGINIA
ELMIRA
ERIE
EXTREME NORTHWEST OHIO
EXTREME NORTHWESTERN PENNSYLVANIA
EXTREME SOUTHEASTERN PENNSYLVANIA
EXTREME WESTERN NEW YORK
FLORIDA
GEORGIA
GREAT LAKES
GULF OF ALASKA
GULF OF MEXICO
GULF OF ST. LAWRENCE
GULF STATES
HARRISBURG
HUDSON VALLEY
HYANNIS PORT
IDAHO
ILLINOIS
INDIANA
IOWA
ISLIP
ITHACA
JAMES BAY
KANSAS
KENNEDY
KENTUCKY
KINGSTON
LA GUARDIA
LAKE ERIE
LAKE HURON
LAKE MICHIGAN
LAKE ONTARIO
LAKE SUPERIOR
LEE OF LAKE ERIE
LEE OF LAKE ONTARIO
LONG ISLAND
LOUISIANA
LOWER HUDSON VALLEY
MAINE
MARYLAND

MASSACHUSETTS
MICHIGAN
MID ATLANTIC STATES
MIDDLETOWN
MINNESOTA
MISSISSIPPI
MISSISSIPPI VALLEY
MISSOURI
MOHAWK VALLEY
MONTANA
MORRISTOWN
NANTUCKET
NEBRASKA
NEVADA
NEW ENGLAND
NEW HAMPSHIRE
NEW JERSEY
NEW MEXICO
NEW YORK
NEW YORK CITY
NEW YORK CITY AND VICINITY
NEWARK
NEWBURGH
NORTH CAROLINA
NORTH CENTRAL PENNSYLVANIA
NORTH DAKOTA
NORTHEASTERN MAINE
NORTHEASTERN MARYLAND
NORTHEASTERN NORTH CAROLINA
NORTHEASTERN PENNSYLVANIA
NORTHEASTERN SOUTH CAROLINA
NORTHEASTERN VIRGINIA
NORTHEASTERN WEST VIRGINIA
NORTHERN CONNECTICUT
NORTHERN DELAWARE
NORTHERN HUDSON VALLEY
NORTHERN MAINE
NORTHERN MARYLAND
NORTHERN MASSACHUSETTS
NORTHERN NEW HAMPSHIRE
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NORTHERN RHODE ISLAND
NORTHERN SOUTH CAROLINA
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NORTHERN VIRGINIA
NORTHERN WEST VIRGINIA
NORTHWESTERN MAINE
NORTHWESTERN NEW JERSEY
NORTHWESTERN PENNSYLVANIA
NORTHWESTERN SOUTH CAROLINA
NORTHWESTERN VIRGINIA
NORTHWESTERN WEST VIRGINIA
NOVA SCOTIA
OHIO
OHIO VALLEY
OKLAHOMA
ONTARIO
OREGON
PENNSYLVANIA
PHILADELPHIA
PITTSBURGH
PLAINS
PLAINS STATES
POUGHKEEPSIE
QUEBEC
RHODE ISLAND
SOUTH CAROLINA
SOUTH CENTRAL PENNSYLVANIA
SOUTH DAKOTA
SOUTH PLAINS
SOUTHEASTERN MAINE
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SOUTHEASTERN NORTH CAROLINA
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SOUTHERN PENNSYLVANIA
SOUTHERN RHODE ISLAND
SOUTHERN SOUTH CAROLINA
SOUTHERN THIRD OF OHIO
SOUTHERN VERMONT
SOUTHERN VIRGINIA
SOUTHERN WEST VIRGINIA
SOUTHWESTERN MAINE
SOUTHWESTERN OHIO
SOUTHWESTERN PENNSYLVANIA
SOUTHWESTERN VIRGINIA
SOUTHWESTERN WEST VIRGINIA
ST LAWRENCE VALLEY
TENNESSEE
TETERBORO
TEXAS
UPPER HUDSON VALLEY
UNITED STATES
UTAH
VERMONT
VIRGINIA
WASATCH RANGE
WASHINGTON
WASHINGTON DC
WASHINGTON NATIONAL
WEST CHESTER
WEST CENTRAL OHIO
WEST VIRGINIA
WESTERN CONNECTICUT
WESTERN DELAWARE
WESTERN MAINE
WESTERN MARYLAND
WESTERN MASSACHUSETTS
WESTERN NEW HAMPSHIRE
WESTERN NEW JERSEY
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WESTERN NORTH CAROLINA
WESTERN OHIO
WESTERN PART OF WESTERN NEW YORK
WESTERN PENNSYLVANIA
WESTERN RHODE ISLAND
WESTERN SOUTH CAROLINA
WESTERN VERMONT
WESTERN VIRGINIA
WESTERN WEST VIRGINIA
WHITE PLAINS
WILKES BARRE
WILLIAMSPORT

WINDSOR LOCKS
WISCONSIN
WRIGHTSTOWN
WYOMING

EASTERN ONE THIRD OF
EASTERN HALF OF
EASTERN TWO THIRDS OF
NORTHERN ONE THIRD OF
NORTHERN HALF OF
NORTHERN TWO THIRDS OF
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SOUTHERN TWO THIRDS OF
WESTERN ONE THIRD OF
WESTERN HALF OF
WESTERN TWO THIRDS OF

ACROSS HIGH GROUND
ACROSS HIGHER TERRAIN
ACROSS MOUNTAINS
ACROSS RIDGES
ACROSS ROUGH TERRAIN
ADJACENT COASTAL WATERS
ALL SECTORS
ALONG SHORE
ALONG THE COAST
AT THE COAST
BORDER
BOUNDARY
CITY
COAST
COASTAL
COASTAL PLAINS
COASTAL WATERS
COASTLINE
DISTRICT
FIELD
GULF
HIGH PLAINS
HIGH PLATEAU
HILL
HILLS
HILLTOP
IN THE HILLS
IN THE VICINITY OF
IN THE VICINITY OF INDUSTRIAL AREAS
IN VALLEYS
IN VICINITY
INDUSTRIAL
INLAND
INTERCONTINENTAL
INTERIOR
INTERIOR VALLEYS
INTER-MOUNTAIN REGION
LAKE
LOWLANDS
MAINLAND
MOUNTAIN
MOUNTAINOUS
MOUNTAINS

NEAR COAST
NEAR MOUNTAINS
OCEAN
OFFSHORE
OFF SHORE
OVER INTERIOR
OVER INTERIOR SECTIONS
OVER MOUNTAINS
PANHANDLE
PENINSULA
REGION
REGIONS
RIDGE
RIDGES
RIVER
SEA
SHORE
SHORELINE
TERRAIN
VALLEY
VALLEYS
VICINITY
WATER
WATERS

CORPUS OF NUMBERS

MINUS ONE FIVE
MINUS ONE FOUR
MINUS ONE THREE
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MINUS ONE ZERO
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SEVEN TENTHS
EIGHT TENTHS
NINE TENTHS

UNDIFFERENTIATED WORDS AND PHRASES

A FEW
ABOUT
ABOVE
ABOVE FREEZING LEVEL
ABOVE GROUND
ABOVE GROUND LEVEL
ABOVE SEA LEVEL
ABUNDANT
ACCELERATE
ACCOMPANIED
ACCOMPANY
ACCUMULATE
ACCUMULATION
ACROSS
ACTIVE
ACTIVITY
ADDITIONAL
ADDITIONALLY
ADJACENT
ADVECTION
ADVISORY
AFFECT
AFFECTING
AFTER
AFTER PASSING
AFTER THE HOUR
AGAIN
AHEAD
AIR
AIR MASS
AIR ROUTE TRAFFIC CONTROL
AIR ROUTE TRAFFIC CONTROL CENTER
AIR TRAFFIC CONTROL
AIR TRAFFIC CONTROL TOWER IN OPERATION FROM
AIR TRAFFIC CONTROL BEACON INTERROGATOR
AIR TRAFFIC CONTROL FACILITY
AIR-TO-GROUND
AIRCRAFT
AIRMEN:S METEOROLOGICAL INFORMATION
AIRMET
AIRPORT
AIRPORT ADVISORY SERVICE
AIRPORT OF ENTRY
AIRPORT SURFACE DETECTION EQUIPMENT
AIRPORT TRAFFIC CONTROL TOWER
AIRWAY
ALL
ALL AREAS
ALL QUADRANTS
ALL RIGHT
ALL TIMES ARE GREENWICH MEAN TIME
ALOFT
ALONG
ALONG A LINE FROM
ALSO
ALTERNATE
ALTIMETER
ALTIMETER SETTING
ALTITUDE
AMENDED
AMENDMENT
AMOUNT
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AND BECOME STATIONARY ALONG A LINE FROM
AND CONTINUING BEYOND
ANOTHER
ANTICYCLONIC FLOW
APPARENT
APPEAR
APPROACH
APPROACH CONTROL
APPROACHES
APPROACHING
APPROXIMATE
APPROXIMATELY
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AREAS
AROUND
AS
AS IT MOVES
ASCEND
ASCENDING
AT
AT OR ABOVE
AT OR BELOW
AT OR NEAR SURFACE
AT SURFACE
AT TIMES
AURORA BOREALIS
AUTOMATIC INSTRUMENT LANDING SYSTEM
AUTOMATIC TERMINAL INFORMATION SERVICE
AVAILABLE
AVERAGE
BACKING
BAROMETER
BARRIER
BASE
BASES
BE
BEACH
BEARING
BECOME
BECOMES
BECOMING
BECOMING MIXED
BECOMING MORE WIDESPREAD
BECOMING MOSTLY
BECOMING OBSCURED
BEFORE
BEGAN
BEGIN
BEGINNING
BEHIND
BEING
BELOW
BENEATH
BETTER
BETWEEN
BEYOND
BOTH
BREAK
BREAKS
BRIEF
BRIEFLY
BRISK
BUILD
BUILDING
BUILDS
BUILDUP
BUILT

BUILDUPS
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CALM
CANCEL
CANCEL ADVISORY AT
CANCEL AT
CAPE
CAUTION
CAUTION ADVISED UNTIL FURTHER NOTICE
CEILING
CEILINGS
CELLS
CENTER
CENTERED
CENTERED OVER
CENTRAL
CHANCE
CHANCE LOCALLY OF
CHANCE OF
CHANCE OF A
CHANCE OF INDEFINITE
CHANCE OF OCCASIONAL
CHANGE
CHANGED
CHANGING
CHANGING TO
CIRCULATE
CIRCULATION
CLEAR
CLEARANCE
CLEARED
CLEARING
CLOSED
CLOSED PERMANENTLY
CLUSTERS
COLD
COLDER
COLDER AIR
COMBINE
COMMENCE
COMMISSIONED
COMMUNICATIONS
COMPLETE
COMPLETED
CONDITION
CONDITIONS
CONFINED
CONSIDERABLE
CONSTRUCTION
CONTINENTAL
CONTINUE
CONTINUE ADVISORY BEYOND
CONTINUE BEYOND
CONTINUED
CONTINUES
CONTINUING
CONTINUOUS
CONTINUOUSLY
CONTROL ZONE
CONTROL ZONE FROM
CONVERGE
CONVERGING
COOL
COOL AIR
COOLER
COOLER AIR
CORNER
COULD
COUPLED
COVER
COVERED
CRANE
CROSS
CYCLOGENESIS
CYCLONIC FLOW
DAILY
DANGER
DAY OPERATIONS
DECELERATE
DECELERATING
DECOMMISSION
DECOMMISSIONED
DECREASE
DECREASED
DECREASES
DECREASING
DEEP
DEEPENING
DEEPER
DEGREES
DEGREES AT
DEGREES CENTIGRADE
DEGREES FAHRENHEIT
DENSE
DEPTH
DETERIORATE
DETERIORATING
DEVELOP
DEVELOPING
DEVELOPING BY
DEVELOPS
DEW POINT
DIAMETER
DIFFUSE
DIMINISH
DIMINISHED
DIMINISHING
DIMINISHING BY
DIMINISHING TO
DIMLY
DIRECTION
DIRECTIONAL
DISABLED
DISPLACED
DISSIPATE
DISSIPATED
DISSIPATING
DISTANCE
DISTANT
DIVIDING
DOMINANT
DOUBTFUL
DOWN
DOWNDRAFTS
DOWNSLOPE
DOWNWARD VERTICAL VELOCITY
DRAFTS
DRIER
DRIER AIR
DRIFT
DRIFTING
DRIFTS
DROPPING
DRY
DRY AIR
DRYING
DUE

DURATION
DURING
EARLY
ECHO
ECHOES
EDGE
EFFECTIVE
EITHER
ELEVATION
ELSEWHERE
EMBEDDED
END
END OF MESSAGE
END OF PERIOD
ENDED
ENDING
ENDING BY
ENROUTE FLIGHT ADVISORY SERVICE
ENTIRE
EQUATORIAL
EQUIPMENT
ESPECIALLY
ESPECIALLY OVER
ESTIMATE
ESTIMATED
EXCEPT
EXCESS
EXPECT
EXPECTED
EXPECTED TO BECOME
EXPIRED
EXTEND
EXTENDS
EXTENDING
EXTENDING FROM
EXTENSIVE
EXTREME
FACILITY
FALLING
FARTHER
FEET
FEET DEEP
FEET PER MINUTE
FEW
FIRST
FLIGHT
FLIGHT PLAN
FLIGHT PRECAUTIONS ARE RECOMMENDED FOR
FLIGHT SERVICE STATION
FLOOD
FLOODED
FLOW
FLUCTUATING
FOG DISPERSAL OPERATIONS
FOLLOW
FOLLOWED
FOLLOWED BY
FOLLOWING
FOLLOWS
FOOT
FOR
FORECAST
FORM
FORMING
FORWARD
FREEZE
FREEZING
FREEZING LEVEL
FREQUENCY
FREQUENT
FREQUENTLY
FREQUENTLY ABOVE
FREQUENTLY BECOMING
FREQUENTLY BELOW
FROM
FROM THE
FRONTOGENESIS
FRONTOLYSIS
FROZEN
FULL
FULL LENGTH AND WIDTH
FURTHER
GENERAL
GENERALLY
GENERATE
GENERATING
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GREATER
GREATER THAN
GREENWICH MEAN TIME WHICH IS
GREENWICH MEAN TIME TO
GROUND
GROUND-TO-AIR
GROUND-TO-AIR AND AIR-TO-GROUND
GUSTING
GUSTING TO
GUSTS
GUSTS REACHING
GUSTY
GUSTY WIND
HALF
HARD
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HAZARD
HEADING
HEADWIND
HEADWINDS
HEAVIER
HEAVY
HEIGHT
HEIGHT ABOVE
HEIGHTS
HERE
HIGH
HIGH FREQUENCY
HIGH FREQUENCY DIRECTION-FINDING STATION
HIGH GROUND
HIGH LEVEL FORECAST
HIGHER
HIGHER LAYER
HIGHER TERRAIN
HIGHER TERRAIN FREQUENTLY OBSCURED
HIGHER TERRAIN OBSCURED
HIGHER TERRAIN OCCASIONALLY OBSCURED
HIGHEST
HIGHEST TEMPERATURE
HORIZON
HOT

HOT AIR
HOTTER
HOTTER AIR
HOWEVER
HUMID
HUNDRED
ICE
ICING
IDENTIFICATION
IDENTIFIED
IDENTIFIER
IDENTIFY
IF
IF NOT POSSIBLE
IFR
IFR OPERATIONS
ILS APPROACH
IMMEDIATE
IMMEDIATELY
IMPROVE
IMPROVEMENT THEREAFTER
IMPROVING
IMPROVING TO
IN
IN ALL AREAS EXCEPT
IN INTERMITTENT
IN OCCASIONAL
IN SCATTERED
INCH
INCH IN DIAMETER
INCHES
INCHES IN DIAMETER
INCOMING
INCREASE
INCREASING
INCREASINGLY
INDEFINITE
INOPERATIVE
INSTRUMENT FLIGHT RULES
INTENSE
INTENSIFY
INTENSIFYING
INTENSITY
INTENSITY UNKNOWN
INTERMITTENT
INTERSECTION
INTO
INVERSION
IRREGULAR
IS
IS COVERED BY
ISOLATED
IT
ITS
JET
JET RUNWAY BARRIER
JET STREAM
JUST
KILO HERTZ
KNOT
KNOTS
LAND
LANDING
LARGE
LAST
LATE
LATER
LATEST METEOROLOGICAL OBSERVATION
LATITUDE
LEAD
LEE
LEFT
LENGTH
LESS
LESS THAN
LEVEL
LEVELS
LIE
LIFTING
LIGHT
LIGHT AND VARIABLE
LIGHT TO MODERATE
LIKELY
LIMIT
LIMITED
LIMITED AVIATION WEATHER REPORTING STATION
LIMITS
LINE
LINES
LITTLE
LITTLE CHANGE
LITTLE CHANGE IN TEMPERATURE
LOCAL
LOCAL MEAN TIME
LOCAL STANDARD TIME
LOCALLY
LOCATED
LONGITUDE
LOW
LOW FREQUENCY
LOW IFR
LOW LEVEL
LOW LEVEL WIND SHEAR IS EXPECTED AT
LOWER
LOWERING
LOWERING TO
LOWEST TEMPERATURE
MAGNETIC BEARING
MAGNETIC HEADING
MAINLY
MARGINAL
MARITIME
MARKED
MARKED DURING DAY
MARKER
MAXIMUM
MEAN SEA LEVEL
MEDIUM FREQUENCY
MEDIUM RANGE
MEGAHERTZ
MERGING
MIDDLE
MIDPOINT
MILD
MILD AIR
MILE
MILES
MILES OR LESS
MILES OR MORE
MILLIBARS
MINIMUM
MINUS
MINUTES AFTER THE HOUR
MIXED
MIXED WITH
MODERATE
MODERATE FLOW
MODERATE OR GREATER

MODERATE TO STRONG WINDS
MODERATE TO SEVERE
MOIST
MOIST AIR
MOISTURE
MONITOR
MORE
MORE FREQUENT OVER
MORE WIDESPREAD
MOST
MOSTLY
MOUNTAIN WAVES
MOVE
MOVEMENT
MOVES
MOVING
MUCH
MULTIPLE
NARROW
NAUTICAL MILE
NAUTICAL MILES
NEAR
NEAREST
NEARING
NEARLY
NEEDED
NEXT
NIGHT OPERATIONS
NO
NO AMENDMENTS WILL BE ISSUED
NO CHANGE
NO CHANGE IN WEATHER
NO ECHOES
NO PILOT BALLOON OBSERVATION AVAILABLE
NO RAWIN OBSERVATION AVAILABLE
NO REPORT WILL BE FILED NEXT COLLECTION
NO RESTRICTIONS
NO SIGNIFICANT CHANGE
NONE
NOT
NOTICE TO AIRMEN
NOW
NUMBER
NUMEROUS
OBSCURE
OBSCURED
OBSCURING
OBSCURING HIGHER TERRAIN
OBSERVATION
OBSERVED
OBSTRUCT
OBSTRUCTION
OBSTRUCTIONS
OCCASIONAL
OCCASIONALLY
OCCLUDE
OCCLUDED
OCCLUSION
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OF
OF THE SKY
OFF
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ON TOP
ONLY
OPEN
OPERATIONS
OR
OR GREATER
OTHER
OTHERWISE
OUT
OUT OF SERVICE
OUT OF THE AREA
OUTER
OUTLET
OUTLOOK
OVER
OVER THE FORECAST AREA
OVERHEAD
PACKED
PARACHUTE JUMPING ACTIVITIES
PARALLEL
PARTIAL
PARTIALLY
PARTLY
PASS
PASSAGE
PASSING
PATCHES
PATCHES OF
PATCHY
PATTERN
PATTERNS
PEAK
PEAK WIND
PER
PERIOD
PERMANENTLY
PERMISSION
PILOT BALLOON OBSERVATION
PILOT REPORTS
PLUS
POINT
POLAR
POLE
POOR
PORTION
PORTIONS
POSITION
POSSIBILITY
POSSIBLE
POSSIBLY
POSSIBLY BECOMING SEVERE
POSSIBLY REACHING SEVERE LIMITS
PRECAUTION
PRECEDE
PRECEDED BY
PRESENT
PRESENT INDICATIONS ARE
PRESSURE
PREVAIL
PREVAILING
PREVAILS
PRIMARILY
PRIMARILY OVER
PRINCIPALLY
PRIOR
PRIOR PERMISSION ONLY
PROBABILITY
PROBABLE
PROCEEDED
PROGRESS
QUADRANT
QUADRANTS
QUARTER
QUARTERS
RADAR
RADAR AIR TRAFFIC CONTROL FACILITY

RADAR APPROACH CONTROL
RADAR WEATHER REPORT
RADAR WEATHER REPORT EQUIPMENT INOPERATIVE DUE TO BREAKDOWN
RADAR WEATHER REPORT NO ECHOES OBSERVED
RADAR WEATHER REPORT NOT AVAILABLE, OR OMITTED
RADIALS
RADIO
RADIUS
RAGGED
RAILS
RAPID
RAPIDLY
REACH
REACHING
RECOMMEND
RECOMMENDED
RELATIVE
REMAIN
REMAINDER
REMAINING
REMOTE COMMUNICATIONS OUTLET
REPLACED
RESUMED OPERATION
RETURNED TO SERVICE
RIDGES OBSCURED
RIDGES OCCASIONALLY OBSCURED
RIGHT
RISING
RISING TO
RISK
ROUGH
ROUGH TERRAIN
ROUTE
ROUTES
RUNWAY
RUNWAY CONDITION READING
RUNWAY VISIBILITY
RUNWAY VISIBILITY BY OBSERVER
RUNWAY VISIBILITY NOT AVAILABLE
RUNWAY VISIBILITY VALUE
RUNWAY VISUAL RANGE
RUNWAY VISUAL RANGE CENTER
RUNWAY VISUAL RANGE MIDPOINT
RUNWAY VISUAL RANGE MIDPOINT NOT AVAILABLE
RUNWAY VISUAL RANGE NOT AVAILABLE
RUNWAY VISUAL RANGE ROLLOUT
RUNWAY VISUAL RANGE ROLLOUT NOT AVAILABLE
RUNWAY VISUAL RANGE TOUCHDOWN
RUNWAY VISUAL RANGE TOUCHDOWN NOT AVAILABLE
SAME
SCATTERED
SEA LEVEL
SECOND
SECTION
SECTIONS
SECTOR
SECTORS
SEVERAL
SEVERE
SEVERE WEATHER FORECAST
SHALLOW
SHARP
SHIFT
SHIFTING
SHIFTING TO
SHORT
SHORTLY
SHOULD
SIDE
SIGMET
SIGNIFICANT
SIGNIFICANT WEATHER
SIGNIFICANT METEOROLOGICAL INFORMATION
SIX HOUR OUTLOOK AFTER
SLIGHT
SLIGHTLY
SLOPE
SLOPING
SLOW
SLOWLY
SMALL
SMOOTH
SOFT
SOLID
SOME
SOMETIME
SOMEWHAT
SPECIAL
SPEED
SPEEDS
SPREAD
SPREADING
SPREADING ACROSS AREA
STABLE
STABLE AIR
STACK
STAGNATION
STATIONARY
STATION
STEADY
STRONG
STRONG AND GUSTY LOW LEVEL WINDS
STRONG FLOW
STRONG GUSTY SURFACE WINDS
STRONG LOW LEVEL WIND SHEAR
SUBSIDE
SUBSIDING
SUN
SUPPLEMENTARY AVIATION WEATHER REPORTS
SURFACE
SURFACE AND ALOFT
SURFACE OBSERVATIONS
SURFACE WIND GUSTS TO
SURFACE WINDS
SURFACE WINDS IN EXCESS OF
SWELLING
SYNOPSIS
SYNOPTIC
SYSTEM
TAKEN
TEMPERATURE
TEMPORARILY
TEMPORARY
TEN MINUTE MEAN RUNWAY VISUAL RANGE
TEN MINUTE MEAN RUNWAY VISUAL RANGE NOT AVAILABLE
TENDENCY
TERMINAL FORECAST
THAN
THE
THE FOLLOWING ARE THE OBSERVATIONS TAKEN AT
THE FORECAST OVER THE ROUTE FROM
THE NEXT FORECAST WILL BE
THE NEXT FORECAST WILL BE ISSUED AT
THE WINDS ALOFT FORECAST FOR

THEN
THEREAFTER
THICK
THICKENING
THIN
THIS
THIS FORECAST WILL NOT BE AMENDED
THOUSAND
THOUSAND FEET
THRESHOLD
THRESHOLD DISPLACED
THROUGH
THROUGHOUT
TIME
TIMES
TIP
TO
TO A DEPTH OF
TO A POSITION ALONG A LINE FROM
TO A POSITION NEAR
TO NEAR
TOP
TOPPING
TOUCHDOWN
TOUCHDOWN ZONE
TOWARD
TOWARDS
TOWER
TOWERING
TRACE
TRACON
TROPICAL
TROUGH
TRUE
TURBULENT
TWENTY-FOUR HOUR AIRMET
ULTRA HIGH FREQUENCY
ULTRA-HIGH FREQUENCY COMMUNICATION
UNABLE
UNAVAILABLE
UNCONTROLLED
UNDER
UNFAVORABLE
UNKNOWN
UNLESS
UNLIMITED
UNMARKED
UNMONITORED
UNRESTRICTED
UNSEASONABLE
UNSTABLE
UNSTABLE AIR
UNTIL
UNTIL FURTHER ADVISED
UNTIL FURTHER NOTICE
UNUSABLE
UP
UP AND DOWN DRAFTS
UP DRAFTS
UPPER
UPPER WINDS
UPSLOPE
UPWARD VERTICAL VELOCITY
USABLE
VARIABLE
VEER
VELOCITY
VERTICAL MOTION
VERY
VERY HEAVY
VERY HIGH FREQUENCY
VERY HIGH FREQUENCY DIRECTION-FINDING STATION
VFR
VFR OPERATIONS
VIOLENT
VISIBLE
VISIBILITIES
VISIBILITY
VISUAL
VISUAL FLIGHT RULES
WARM
WARM AIR
WARMER
WARMER AIR
WARNING
WAVE
WEAK
WEAK FLOW
WEAKEN
WEAKENING
WEAKER
WEATHER
WELL
WET
WHICH
WHILE
WIDE
WIDELY
WIDELY SCATTERED
WIDESPREAD
WIDTH
WILL
WILL BE ISSUED
WILL BECOME STATIONARY
WILL CONTINUE MOVING SLOWLY
WILL CONTINUE TO DECELERATE AND WEAKEN BECOMING STATIONARY ALONG A LINE FROM
WILL DEVELOP
WILL DISSIPATE
WILL DRIFT
WILL MOVE
WILL MOVE RAPIDLY THROUGH THE AREA
WIND
WIND CALM
WIND SHEAR
WIND SHIFT
WIND SHIFTED
WIND SHIFTING
WINDS
WINDS BELOW SHEAR ZONE FROM
WINDS IN EXCESS OF
WINDS OCCASIONALLY
WINDS OCCASIONALLY BECOMING
WINDY
WITH
WITH A CHANCE OF
WITH INCREASING
WITH OCCASIONAL
WITH THE POSSIBILITY OF
WITHIN
WITHOUT
WORK
WORK IN PROGRESS
WORSE
YARDS
ZONE

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